Imperial Bureau of Plant Genetics

(For Crops other than Herbage)

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Note.—Initialled abstracts are written by the following:

Mr. F. Billington	F. B.
Dr. A. Buchinger	A. B.
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Dr. J. Wishart	J. W.

* General studies, see also individual crops.

Plant Breeding Abstracts.
Vol. IV, No. III.

Part I. British Empire

GENETICS 575

515. SANSOME, F. W. 575:633
How new plants are brought about.
J. R. Hort. Soc. 1933 : 58 : 314-19.

A semi-popular account of the main genetic principles underlying plant breeding. The phenomena of mutation, hybridization and chromosome changes such as polyploidy as sources of variation are discussed.

The practical significance of chromosome doubling following hybridization in producing new fertile forms from normally unproductive crosses or sterile forms is emphasized.

516. 575.113
575.17
WILLEY, A.
The unit character in genetics.
Nature 1934 : 133 : 137-38.
GATES, R. R.
Ibid p. 138.

(1) A defence of the conception of unit characters, supported by evidence of phyletic loss of wings in *Chionea*.

(2) A reply dealing with Professor Willey's comment and at the same time pointing out the phylogenetic importance of his view of the unit character concept.

EVOLUTION 576.12

517. HURST, C. C. 576.12:575.1
The significance of genetics in evolution.
Gdnrs'. Chron. 1933 : 94 : 291-92.

Evolution which in general is a slow process has been proceeding for at least a thousand million years. It is discontinuous, particulate and indeterminate. Under natural selection evolution is progressive. Measurably, evolution consists in the changing of old genetical species into new ones and in the course of secular time the new genetical species that survive become genera, tribes, families and so on.

That different genera often have different modes of species evolution, some of which are slow, others comparatively rapid, is exemplified by a consideration of the genus Rosa, which combines both modes of species evolution. It is shewn that the slowest evolution is by the mutations of single genes and the transmutations of sections of chromosomes, while the most rapid is by hybridization and the transmutation of whole sets of chromosomes. In both types sex plays its part and the final controller is natural selection which determines the survival of the new species in nature.

CYTOLOGY 576.3

518. WRIGHT SMITH, W. 576.3:581.4
Some aspects of the bearing of cytology on taxonomy.
Proc. Linn. Soc. Lond. 1932/33 : Part IV : 151-82.

From a discussion of the taxonomic-cytological relation in *Primula* the author demonstrates the value of co-operation between the morphological and the cytological methods of attack on the problem of the taxonomy of a genus.

519. 576.312.2
RAU, N.S. 576.311.1
A note on the emission of globules of basophilic material from the nucleus into the cytoplasm during the telophase of nuclear division.
J. Ind. Bot. Soc. 1933 : **12** : 287-92.
The phenomenon described is regarded as probably representing a phase in the cyclic exchange of nucleic acid compounds between the nucleus and the cytoplasm. In the author's opinion the cytoplasm contributes nucleic acid compounds to the nuclear components during nuclear division after the completion of which the intranuclear nucleic acid becomes for the most part stored in the nucleus while that derived from the cytoplasm is apparently returned to it in the form of the globules described.

520. MAZUMDAR, G. P. and DATTA, R. M. 576.312.315
The rôle of the nucleolus in *Hibiscus mutabilis* Linn.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Bot. Abst. 60 : p. 18.
The behaviour and role of the nucleolus in the microspore-mother-cells of *H. mutabilis* and recent relevant literature on the nucleolus are discussed.

BOTANY 581

521. SINGH, T. C. N. 581.162.3:578.08
An efficient method of selfing crop-plants.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Agric. Abst. 34 : 10–11.
The introduction of the appropriate type of insect or other natural fertilizing agents into the muslin bags used in self-pollination work is suggested as a means of selfing plants, such as Sunn hemp.

522. GATES, R. R. 581.162.5
Sterility in plants.
J. R. Hort. Soc. 1934 : **59** : 141–44.
A summary of existing knowledge on sterility in plants. The work of Darwin, Jost, Correns and Lehmann is cited and the researches of East on tobacco, of Stout on lilies and of Williams and Slow on red clover are discussed.
The self-fertile condition and the self-sterility factors have probably arisen from time to time as mutations and are apparently perpetuated because of the advantage of the heterozygous condition in the plant.

FIELD TESTS 631.421

523. PATERSON, D. D. 631.421:519.24
Experimentation and applied statistics for the practical agriculturist.
Trop. Agriculture 1933 : **10** : 267–76, 303–11, 346–51.
The object of this article is to give in an easily assimilated form a brief account of some of the more commonly adopted plot arrangements in field experiments and to describe for each a statistical method that will give a valid interpretation of the yield date.

524. VAIDYANATHAN, M. 631.421:519.24:633.61
A statistical study of " Ideal size and shape of plot for sugarcane " based upon tonnage experiment with Co. 213, conducted at Meghoul (Pusa) in 1933.
21st Ann. Meet. Ind. Sci. Cong. Bombay, 1934 : Sect. Agric. Abst. 1 : p. 1.
In continuation of a previous experiment a uniformity trial was examined for all possible combinations of plot size and shape. The best size was found to be 1/20 acre, and the best ratio of length to width 8 to 15. J. W.

525. VAIDYANATHAN, M. 631.421:519.24:633.72
"Covariance" applied to experimental plots at Tocklai tea experimental station.
21st Ann. Meet. Ind. Sci. Cong. Bombay, 1934 : Sect. Agric. Abst. 2 : p. 1.
The method of "covariance" is described in its application to the design of new experiments on the basis of preliminary yields. The construction of the tables and the arithmetical procedure are described, and examples are furnished. J. W.

526. 631.421:633.18
MAHALANOBIS, P. C., CHAKRAVORTTI, S. C. and BANERJEE, E. A. R.
Influence of shape and size of plots on the accuracy of field experiments with rice, Chinsurah, Bengal.
21st Ann. Meet. Ind. Sci. Cong. Bombay, 1934 : Sect. Agric. Abst. 8 : p. 3.
A uniformity trial with transplanted rice gave information on the optimum size and shape of plots for future experiments on the area. A detailed analysis was carried out, working out the standard deviation and varying the size of the blocks. Contour lines of fertility shewed the distribution in this respect over the field. J. W.

527. MITRA, S. K. and GANGULI, P. M. 631.421:633.18
Uniformity trial in rice.
21st Ann. Meet. Ind. Sci. Cong. Bombay, 1934 : Sect. Agric. Abst. 9 : 3–4.
Experiments with a uniformity trial shewed that plots of about 60 feet by 10 feet with at least 4 replications would be suitable for experimental purposes. It was found desirable to lay out plots along the fertility gradient and thus eliminate its effect. It was considered best to have randomised blocks, each block being contained in one field, since except for small plots a Latin square could not be completed within a bunded field. J. W.

PLANT DISEASES 632

528. NAPPER, M. E. 632.411.4:576.16:631.521.6
Observations on spore germination and specialization of parasitism in *Cystopus candidus*.
J. Pom. Hort. Sci. 1933 : **11** : 81–100.
Cross inoculations of numerous species or subspecies of Cruciferae shewed that a large number of biological forms of *Cystopus candidus* exist and that some forms can infect host plants of 6 different genera. No appreciable varietal resistance was found.

529. MCDONALD, J. 632.452:576.16
Two new records of physiologic forms of wheat-stem rust in Kenya Colony.
Trans. Brit. Mycol. Soc. 1933 : **18** : 218–22.
The opinion is expressed that one of the forms of *Puccinia graminis tritici*, known in Kenya as K_3, may be confidently identified with that known in America as form 34 ; the other Kenya form K_4 shews close general similarity to form 116 produced artificially in Canada by hybridization.
The distribution of K_3 and K_4 to date are given.

530. MITRA, A. K. 632.484:575.242
A study of certain *Fusaria*.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Bot. Abst. 16 : 4–5.
The question of suitable culture media for six species of *Fusarium* belonging to three different sections was studied.
Saltants differed from their parents in such characters as linear rate of spread, aerial mycelium colour of the substratum, sporulation, average septation, size of the spores and abundance of the chlamydospores.

531. 633
632–1.521.6:575
BELL, G. D. H. 634:581.162.5
Farm crops.
J. R. Agric. Soc. 1933 : **94** : 161–93.

This annual survey after having lapsed for one year has been reincorporated in "The Farmer's Guide to Agricultural Research" which now forms part of the Royal Agricultural Society's Journal.

An account is given of recent work on the improvement of cereal cultivation with special reference to the advances on the pathological and physiological side. Photoperiodism and vernalization and their practical applications are discussed.

The progress made in the investigation of cereal diseases is considered from the following standpoints : the nature of disease resistance, breeding for resistance to rusts and smuts ; varietal resistance and physiological forms of rusts and smuts ; the effect of light on some pathogenic fungi ; and grey spot disease of oats.

The factors affecting standing capacity in relation to lodging are analysed and the results achieved in breeding for resistance are described.

The question of quality and the factors affecting endosperm characters in wheat and recent breeding work on this problem are treated at some length.

Self-sterility and incompatibility in fruit trees are considered, with special reference to the cytological basis of these phenomena. The incompatibility conditions in cherries, plums and apples are briefly discussed.

A bibliography of 51 references concludes the survey.

532. VILLIERS, P. C. de 633:575.42
Selection and improvement.
Fmg. S. Afr. 1934 : **9** : p. 60.

Some practical hints on plant selection are contained in this popular article which deals mainly with selection in animals.

533. LARTER, L. N. H. 633–2–1.521.6:575
Breeding for immunity.
J. Jamaica Agric. Soc. 1933 : **37** : 447–49.

After a brief enumeration of the causes of immunity in its various forms, a concise survey of some of the achievements in breeding for immunity is illustrated by concrete examples from the results obtained with vines, pineapples, potatoes, tobacco, tomatoes, wheat, coffee, cotton, sugar cane and citrus.

Breeding works on similar lines with perennials, such as forest crops is regarded as likely to prove successful.

WHEAT 633.11

534. GRIFFITHS, E. L. and CAYZER, L.S. 633.11:664.641.016(94)
The wholemeal fermentation time test. A measure of quality for small samples of wheat.
Agric. Gaz. N.S.W. 1934 : **45** : 14–17.

A detailed description of the Pelshenke test with illustrations and a table of results obtained from a number of Australian commercial varieties of wheat which are provisionally classified according to their gluten quality.

OATS 633.13

535. 633.13:575.11
JOHNSON, L. P. V. 633.13–2.451–1.521.6:575.11
Studies on the inheritance of covered smut reaction, lemma colour, awn development and rachilla pubescence in oats.
Canad. J. Res. 1933 : **9** : 519–41.

A genetic study of the covered smut reaction, lemma colour, awn development and rachilla pubescence was made from the Black Mesdag x Victory oat cross. For the smut reaction

(*Ustilago levis* (K. and S.) Magn.) the F_3 only was used, but for the other characters F_2 and F_3 were observed. Black Mesdag has black grains, strong awns, pubescent rachillas and is very resistant to smut infection. Victory has white grains, weak awns, glabrous rachillas, and is very susceptible to smut infection.
Segregation for smut reaction in F_3 families occurred in the ratio 4 immune : 9 moderately resistant : 3 susceptible. Hybrid susceptibility was as high as 95 per cent. and corresponded with the susceptibility of the non-resistant parent. Immune F_3 lines bred true for immunity in the F_4. It is concluded that Black Mesdag possesses a dominant factor, which in a homozygous condition gives high resistance or immunity, and a less potent supplementary factor for resistance, while Victory possesses the recessive allelomorphs of these factors.
Lemma colour segregated in the two factor ratio 12 black : 3 grey : 1 white ; awn development in the two factor ratio 12 strong (twisted, geniculate) : 3 intermediate (twisted, non-geniculate) : 1 weak (non-twisted, non-geniculate) ; while rachilla pubescence gave a ratio of 12 numerous, long hairs : 3 few, short hairs : 1 glabrous.
From a calculation of the relations between percentage of smut infection and grain colour, lemma colour, awn development, rachilla pubescence and callus pubescence by the correlation ratio method it was concluded that no genetic linkages exist between these characters.
F_4 lines, apparently homozygous for white, plump grains, weak awns, strong straw, midseason maturity and smut immunity and probably equal to Victory in quality and to Black Mesdag in smut resistance, have been selected for yield tests.
In addition to an extensive bibliography, historical reviews of the inheritance of smut reaction and of certain grain characters in oats are shewn in convenient tabular form in two appendices.

536. Shaw, F. J. F. and Bose, R. D. 633.13:575.127.2:575.11
Studies in Indian oats. II. Inheritance of some characters in interspecific crosses between *Avena sativa* L. and *Avena sterilis* L. var *culta*.
Ind. J. Agric. Sci. 1933 : **3** : 771–807.

The following crosses were made between the pure line selections of Indian oats, B.S.2 and B.S.4 (both *A. sterilis*) and two foreign varieties of *A. sativa* ; I. Scotch Potato x B.S.4, II. Scotch Potato x B.S.2 and III. Abundance x B.S.4 and the inheritance of both qualitative and quantitative characters was studied.
The type of basal articulation was determined by a one-factor inheritance in which the *sativa* type was dominant.
One factor was concerned in the inheritance of type of awn. Linkage was observed between 'weak' awns and the '*sterilis*' type of basal articulation and the cross-over values were 17·0, 23·0 and 3·3 per cent. for the three crosses respectively.
The data indicated that the inheritance of basal hairs is dependent on at least two factors, one C producing many hairs, the other D few hairs and modifying the effect of C when present with it. Though only a small amount of material was available, the results suggested that the character for long basal hairs is a simple dominant. Two factors were concerned in the inheritance of hairs on the margin of the leaves, the factor for few hairs is assumed to modify the effect of the factor for many hairs when present with it.
In crosses I and II multiple factors are involved in the inheritance of maturity as measured by the date of heading, in cross III the inheritance was monofactorial.
Multiple factors determined the inheritance of height of the plant.
Transgressive segregation was observed in crosses I and II for number of spikelets per panicle, but in cross III the F_2 segregation was within the range of the parents.

537. Shaw, F. J. F. and Bose, R. D. 633.13:575.4(54)
Studies in Indian oats. I. The improvement of the crop by selection and the acclimatization of exotic types.
Ind. J. Agric. Sci. 1933 : **3** : 754–70.

The Indian oat, *Avena sterilis* var. *culta* L., also known as *A. byzantina* Koch. (n=21), is described.
Two pure line selections B.S.1 and B.S.2 were made, differing only in yield and time of ripening.
As, however, the Indian oat, compared with those grown in the United Kingdom, is deficient

in bushel weight and in yield and stiffness of straw, a number of varieties from the British Isles, U.S.A. and South Africa were tried under Indian conditions.
Although growth was good and the straw was excellent, all but Kinwada whose grain was poor ripened too late and shewed a high proportion of sterile spikelets. Crosses which though interspecific were perfectly successful, have therefore been made and the results are described in a succeeding paper (see Abst. 00).
Tests of B.S.1 and B.S.2 have shewn these selections to be good in yield, both of grain and straw, drought resistant, early maturing and fairly resistant to disease.

538. MACINDOE, S. L., SHIRLOW, N. S. and DARRAGH, W. H.
633.13–2.452–1.521.6:575
Leaf or crown rust of oats. Field observations on resistance of varieties.
Agric. Gaz. N.S.W. 1933 : **44** : 887–94.
Owing largely to the breeding of early moderately crown rust resistant varieties such as Buddah and Sunrise, the area under oats for fodder in New South Wales has been trebled in the past 10 years. In a search for crown rust resistant types for breeding purposes several hundred varieties and fixed cross-breds have been under observation at various research centres in New South Wales. The promising results so far obtained are recorded.
From previous observations by Macindoe and other unpublished data apparently there is no association between resistance to leaf and stem rust, and further unpublished findings suggest that there is no association between resistance to smut and resistance to either form of rust. Nor does resistance to either rust seem to be a specific character, for both *A. sativa* and *A. sterilis* are represented in the markedly susceptible and in the rust free groups.
This preliminary work points first to Victoria (which is possibly a hybrid between *A. sativa* and *A. byzantina*) and secondly to Bond as the most suitable crown rust resistant parents for hybridization work.
In order to combine resistance to both rusts, Victoria, which is resistant to both crown rust and smut has been crossed with Laggan which is resistant to stem rust but very susceptible to crown rust and smut. Other crosses regarded as promising have been made between highly resistant Victoria x Richmond hybrids (obtained from Iowa) and a number of varieties with a wide range of type and maturity characteristics.

MAIZE 633.15

539. SAUNDERS, A. R. 633.15–2.19–1.521.6:575
Maize pinking.
Fmg. S. Afr. 1933 : **8** : 249–50.
The type of discolouration in maize known as pinking is caused by the action of sunlight on the ear. The tendency to develop this defect is heritable and it has therefore been possible by inbreeding and selection to isolate lines free from this tendency even when exposed to intense sunlight. The mode of inheritance is rather complex and at least three different factors are involved. In some hybrid progeny a new type of pinking in which the cob is intensely coloured and the seeds only slightly tinged, if at all, appeared.
Field selection of seed is recommended as a control measure. All varieties of maize are liable to be affected by pinking, but it is of course most noticeable in the white types and also most serious in them from the standpoint of grading.
New varieties in which the peculiarity is absent or slight are being bred at the Potchefstroom School of Agriculture, but seed will not be available for distribution for some time.

BARLEY 633.16

540. 633.16:575(44)
The cultivation of malting barleys in France.
J. Inst. Brew. Lond. 1934 : **40** : p. 27.
Over thirty years ago the Société d'Encouragement de la Culture des Orges de Brasserie en France was founded by French maltsters and brewers with the object of isolating and testing new

strains of barley of superior quality and yield and suited to the various districts. Now over 1,300 strains have been tested on a field-scale and in a few years suitable malting barleys will be available to growers.
In 1933, one selected strain compared favourably with Plumage Archer and seed should be available in 1935.
The importance of collaboration between growers and the Société in ensuring the continued purity of the races put into large scale cultivation is stressed.

MILLETS AND SORGHUMS 633.17

541. RANGASWAMI AYYANGAR, G. N., VIJIARAGHAVAN, C., and GOMATHINAYAGAM PILLAI, V. 633.17 633.17:581.162.3
Studies on *Pennisetum typhoideum* (Rich.). The Pearl millet, Part I.
Ind. J. Agric. Sci. 1933 : **3** : 688–94.
The first of a series of studies on anthesis in millets to be carried out by the Millet Breeding Station, Coimbatore.

542. RANGASWAMI AYYANGAR, G. N. 633.17:575.11
Recent work on the genetics of millets in India.
Madras Agric. J. 1934 : **22** : 16-26.
The paper is a summary of genetical work on the Sorghums, *Pennisetum typhoideum*, *Eleusine coracana*, *Setaria italica*, *Paspalum scrobiculatum*, *Panicum miliaceum* and *Panicum crusgalli* var. *frumentaceum*. The various factors which have been identified in each, together with such interrelations as have been shewn to exist between these are briefly noted. H. M. L.

633.17:575.11.061.1:581.46
543 RANGASWAMI AYYANGAR, G. N., KRISHNA RAO, P. and ACHYUTHA WARIAR, U.
Inheritance of characters in *Ragi*, *Eleusine coracana* (Gaertn.), the finger millet ; Part VII, Fist-like earheads.
Ind. J. Agric. Sci. 1933 : **3** : 1072–79.
The paper is a continuation of previous studies (see "Plant Breeding Abstracts" III, Abst. 149), in which a factor (Q) was defined as determining the character of the head, whether curved or open, through the density of the spikelets, while a factor (E) determined the extent of the curvature, giving top-curved or in-curved, through the elongation of the rachis. Here a further form, " fist-like," with fingers compactly in-curved, is described and its inheritance worked out. There appear to be two factors (E_1) and (E_2) which determine the elongation of the fingers. When neither is present the finger length is very short and, in presence of (Q), the form is fist-like. Either alone gives the short finger as previously described while both together give the long finger with the corresponding top-curved and in-curved forms when the factor (Q) is present. A number of tables are given illustrating this behaviour. All three factors are independent of the various plant, grain and unripe pericarp colour factors described in earlier papers. H. M. L.

633.17:575.11.061.6:581.46
544. RANGASWAMI AYYANGAR, G. N., ACHYUTHA WARIAR, U. and RAMABHADRAN, G.
Inheritance of characters in *Ragi*, *Eleusine coracana* (Gaertn.), the finger millet. Part VIII, Earhead colour factors.
Ind. J. Agric. Sci. 1933 : **3** : 1080–84.
In an earlier paper (see " Plant Breeding Abstracts," Vol II: Abst. 172), three forms of purple pigmentation were described ; here details are given of a fourth to which the name " medium purple " is applied. In this form the vegetative parts bear the full pigmentation characteristic of the purple form but the pigmentation of the earheads is that of the dilute form. Details are given of the results of crossing this fourth form with the three forms earlier identified ; and it is concluded that the depth of manifestation of the purple pigmentation is due to two factors, H_1 and H_2 which, in combination, give a scarcely perceptible intensification of the colour imparted by each separately. They have, also, a negligible effect in the absence of one or both of the intensification factors defined in the earlier paper. H. M. L.

545. MAHALANOBIS, P. C. 633.18:519.241.1

A preliminary note on intervarietal correlation in the rice plant in Bengal.

21st Ann. Meet. Ind. Sci. Cong. Bombay, 1934 : Sect. Agric. Abst. 6 : p. 2.

Mean measurements of a number of characters for 147 varieties are studied. The mean yield is moderately correlated with the number of tillers per plant and with leaf length, but appears to be independent of weight and size or shape of grains, the plant height, the inflorescence length or duration and also of the colour of glumes and kernels or the consistency of the grains.

J. W.

546. 633.18:575(88)

Rice in British Guiana, 1927-1932.

Rice Bull. B. Guiana Dept. Agric. 1933 : No. 1 : Pp. vii+60.

Though experimental work on rice by the Department of Agriculture of British Guiana began in 1902 pure line investigations did not begin until after the reorganization of the Experiment Station, Georgetown, in 1927.

Among the local strains collected from areas under cultivation and subjected to pure line selection from single plants, one long grained variety, Demerara Creole, was most widely distributed, one other variety, Blue Stick in the Essequibo district, being its sole competitor. The methods of pure line selection and of determining varietal purity are set out in full and illustrated by graphs. An instrument has been devised for making grain measurements. The importance of uniformity of grain for the production of high quality rice under the present system of grading is emphasized.

A detailed description is given of the more promising varieties imported since 1928 and included in the progeny row tests for observation as a preliminary to subsequent competitive trials with standard varieties.

The commercial extension of pure line padi in 1928 which followed as a natural consequence of the work initiated after the reorganization in 1927 is described.

Carefully planned experiments begun in 1930 include (1) variety tests, comprising yield trials, milling tests and chemical analyses ; (2) spacing experiments ; (3) machinery trials ; and (4) the investigation of the effect of age on viability.

Cross breeding to obtain new varieties suitable to local conditions was begun in 1931 and the 4th generation of hybrids with strong straw and high yield and the Carolina type of grain and maturing in 4–4½ months is already under cultivation. The most successful were the two crosses of Demerara Creole with the early maturing American varieties, Mexican Edith and Americano 1600. Varying degrees of sterility, possibly due to a combination of complimentary genes or to an abnormal chromosome mechanism, appeared in F_2, but the defect has been practically eliminated by careful selection. Other promising crosses are Ganka suama vari x No. 79 and Kristna Kata Kulu x Carolina Edith, the first of these being likely to prove the most successful of all, for the parents differ in only a few characters such as growth period, size of grain and height of plant.

In the course of this genetic research the mode of inheritance of a large number of characters has been studied and the results will shortly be published.

In connexion with rice weevil investigations a machine capable of measuring the hardness of rice was devised.

547. JACK, H. W. 633.18:575(91)

Padi experiments in Malaya 1932-33. Selection and varietal trials.

Malaya Agric. J. 1933 : 21 : 605–30.

A detailed report on the test plots in the various districts. The value of selected strains is evident.

A study of the flowering characters of the more important padi types and a few of their crosses was begun in 1919 and continued in 1928–29, in hopes of synthesizing a genotype combining high grain yield with strength of straw and earliness. From F_3 seed of twenty hybrids the most promising selections have been the combination of the high yielding but late maturing Seraup

36 x Radin 2 which is early maturing and the cross Radin 2 x Nachin 27 which is still earlier. The crosses Siam 29 x Serendah 875 and Siam 29 x Radin 2 have also been made with the object of combining the yield of Siam 29 with the stronger straw of Radin 2 and Serendah 875. Future work will be limited to crosses of special practical value such as Nachin 10 x Siam 29 with stiff strawed types.

548. RAMIAH K. and PARTHASARATHI, N. 633.18:575.11–181.12:581.48
Inheritance of grain length in rice (*Oryza sativa* L.).
Ind. J. Agric. Sci. 1933 : **3** : 808–19.

Not only is the size of the grain, as represented by the ratio length to breadth, sufficiently constant to have formed the basis of classification, but it is of importance from the economic aspect ; uniformity of size being essential for efficient milling.

Evidence is adduced to shew that the effect of environment is negligible and that the measurement of six grains gives a sufficient degree of accuracy. There is, however, evidence of increased coarseness (increase in the length/breadth ratio) as the cumulative result of environmental conditions continued over a series of years.

Earlier work had shewn simple dominance of the short round type over the long narrow type. Here the results of a cross between two types with grain of similar shape but differing in length by nearly 5 mm. are recorded. Parental mean lengths are 5·95 mm. and 11·11 mm. and the F_2 has a strongly marked bimodal curve with modes at 7·9 and 9·9 and extreme limits of 6·1 and 11·7. Analysis of the F_3 agrees with a trifactorial hypothesis. The correlations between length and length/breadth ratio are $+0·59 \pm 0·03$, $+0·63 \pm 0·03$ and $+0·74 \pm 0·02$ respectively for the two parental types and the F_2. There is an inter-relationship between the factors for length and breadth. H. M. L.

549. RAMIAH, K. 633.18:575.11.061.6
Linkages in anthocyan pigment factors in the rice plant.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Agric. Abst. 37 : 11–12.

It has been established that the presence of pigment in any part of the rice plant depends on the presence of two complementary factors. Several other localization factors control the development of pigment in the various parts of the plant. The presence of pigment is always dominant to its absence but the number of factors involved may be one, two or more.

A large number of pigment factors, not recorded hitherto, are discussed. About 26 separate factors have been identified and their inheritance suggests the existence of 4 linkage groups, the component factors of which are enumerated.

550. KADAM, B. S. 633.18:575.11.061.6:581.43
Inheritance of root colour in rice.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Agric. Abst. 36 : p. 11.

On exposure to sunlight the roots of a Burmese variety of rice develop a red colour. Crosses with a colourless variety shewed that red root colour is a dominant character, the genetic basis being a gene R which produces colour in the roots but functions only in the presence of a major factor A without which no colour develops in any part of the plant.

551. KADAM, B. S. 633.18:575.113.6.061.6
A specific colour inhibitor gene in rice.
Current Sci. Mysore 1934 : **2** : p. 246.

From the F_3 ratio obtained in a cross between a purple variety of rice and an all green type, and from other data the presence of an inhibitory factor modifying the factor for anthocyanin production by preventing its exhibition in the leaf region of the plant is inferred.

552. ALAM, M. and TRIVEDI, R. A. P. 633.18:581.162.3
Study in rices of Bihar and Orissa. The biology of flower and the effect of various climatic factors on the opening and closing of the spikelets and bursting of anthers.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Agric. Abst. 38 : p. 12.

Observations have been collected on the time of opening and closing of the flowers and the time of bursting of the anthers in a number of paddy strains differing in time of maturity.

553. KADAM, B. S. and PATIL, G. G. 633.18 Kolamba : 581.162.3:575.2
Blooming and anthesis in Kolamba rice.
Ind. J. Agric. Sci. 1933 : **3** : 577–88.
Observations regarded as of value for developing a hybridization technique. The early, mid-late and late strains exhibited genetic variation in the time of blooming.

554. 633.18:581.48
RAMIAH, K., PARTHASARATHI, N. and RAMANUJAM, S. 633.18:576.356.5
Polyembryony in rice (*Oryza sativa*).
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Agric. Abst. 35 : p. 11.
In a pure line ·1 per cent. of seeds gave rise most frequently to twins but occasionally to triplets which have never before been recorded in rice. Polyembryony was a regular feature of the hybrid progenies having the pure line in question as a parent, but was very rare in other progenies. In addition to identical twins, one case was found in which the pure line produced a pair consisting of a haploid and a diploid and other cases occurred in which hybrid progenies gave rise to either a lethal albino and a normal green or two lethal albinos. It is surmised that in rice polyembryony might on occasion arise by fertilization of more than one egg cell.
Cytological investigations are in progress.

555. 633.18.0015(54)
India in 1931–32.
Current Sci. Mysore 1934 : **2** : 265–66.
A scheme of provincial research on rice is mentioned in this review under which "all species isolated will be fully described, maintained and made available to all parts of India and Burma, selected types will be interchanged and a botanical and agricultural survey made of local rices in each province. The scheme provides for a chain of research stations with suitable sub-stations for special tracts."

FIBRES 633.5

556. JAGANNATHA RAO, C. 633.51(54)
Recent cotton improvement work for the "Northerns" tract.
Madras Agric. J. 1933 : **21** : Abst. 7 : p. 471.
The qualities of N 14, a strain of cotton evolved at the Nandyal Agricultural Research Station and distributed to native growers for the past few years, are briefly discussed.
Some new selections developed at the same station are described and their possibilities as experimental material for future work are indicated.

557. GADALLAH, A. E. 633.51(62)
The Egyptian cotton.
Leafl. Min. Agric. Egypt 1932 : No. 4 : Pp. 16.
Under the two headings, commercial varieties and new strains, a short account is given of each of the existing varieties of Egyptian cottons. Plates shewing types of bolls and seeds are appended.

558. 633.51:575.11:575.24
HARLAND, S. C. 633.51:575.127.2:575.115
The genetics of cotton. Part IX. Further experiments on the inheritance of the crinkled dwarf mutant of *G. barbadense* L. in interspecific crosses and their bearing on the Fisher theory of dominance.
J. Genet. 1933 : **28** : 315–26.
In a previous paper an account was given of the transference of the crinkled dwarf character, occurring in *G. barbadense* as a mutant, to *G. hirsutum* in which the character has not been recorded. Here evidence is given of the behaviour of the character in the generation derived from selfing the sixth generation of the back-cross to *G. hirsutum* and the bearing of this evidence on Fisher's theory of dominance is discussed.

Figures are given for both the fourth and sixth back-cross heterozygote selfed and these agree in giving normal, intermediate and crinkled in approximately a 1 : 2 : 1 ratio but with a deficiency of normals. A comparison of the productivity (number of bolls per plant) of normal and intermediate shews a slight increase in productivity of the heterozygote in both cases, while the heterozygotes of the sixth back-cross selfed shew a slight increase in height over the normals. The above results were obtained with the *G. hirsutum* type T.9 (Meade). In a similar series with the *G. hirsutum* type Virescent Yellow replacing T.9, it was found impossible at the sixth back-cross to separate the heterozygous forms from the normal, thus repeating the condition of full dominance found in *G. barbadense*. When an extracted crinkled from the fourth back-cross selfed was crossed with the *G. hirsutum* type 57 (Triumph) the heterozygous form approached so closely to the normal as to render separation into two groups impossible.
The discussion of the bearing of these results on Fisher's theory of dominance shews that some modification of that theory becomes necessary, and it is concluded that modifiers of dominance, differences in complexes of which characterize the different species, are of advantage to the wild type and are selected on their own account. H. M. L.

559. AFZAL, M. and HUTCHINSON, J. B. 633.51:575.11:677.2
The inheritance of " lintless " in Asiatic cottons.
Ind. J. Agric. Sci. 1933 : 3 : 1124–32.
A record is given of three lintless strains of Asiatic cottons and of a number of crosses derived therefrom. The three strains are, a hairy lintless from a single plant found in a field of *mollisoni* (a form of *G. arboreum* var. *Nanking*) ; a glabrous lintless form also found in a field of *mollisoni* and a glabrous lintless form found in a Burmese strain of *G. arboreum* var. *Nanking* growing in Dharwar. The evidence of these crosses indicates that the two latter have arisen as the result of a single factor, h^G, recessive to normal, but identity in the two cases lacks the proof supplied by a cross between the two forms. The hairy lintless has arisen as the result of a factor, H^L, lethal in the homozygous condition and giving rise to a weak plant in the heterozygous condition. This weakness is evidenced by a deficiency of hairy lintless forms in the offspring of the lintless x normal cross which varies widely as the result of seasonal influence. H. M. L.

560. 633.51:575.11.061.6:581.331.2
RAMANATHA AYYAR, V. and BALASUBRAMANYAN, R.
Inheritance of pollen colour in Asiatic cottons.
Ind. J. Agric. Sci. 1933 : 3 : 1116–23.
The Asiatic cottons, in general, have a pollen colour which is of grade 2·5 in Harland's scheme of grading. In a strain of " Coconadas " (*G. obtusifolium*) a single plant was observed with pollen corresponding to Harland's grade O (cream). This plant was found to breed true to the character and from the strain derived therefrom crosses were made with normal *G. obtusifolium* and *G. herbaceum*. In both cases the cream colour behaved as a simple recessive. Both from this and from a number of interspecific crosses all of which shewed the 2.5 grade, it is concluded that there is an absence of modifying factors in the Asiatic group of cottons, and the bearing of this conclusion on the suggestion by Harland that there is only one species of cultivated Asiatic cotton is indicated. H. M. L.

561. 633.51–2–1.521.6
KOTTUR, G. L. and DESAI, M. K. 633.17–2–1.521.6
Studies in disease resistance with special reference to cotton wilt.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Agric. Abst. 30 : p. 9.
The behaviour of selections of cotton and jowar (Sorghum) resistant to red leaf blight, *Striga* and wilt are described. A considerable difference was found between resistance in the field and under controlled conditions in the greenhouse. Different degrees of resistance are mentioned and their importance in breeding work emphasized.

562. KOTTUR, G. L. and MARALIHALLI, S. S. 633.51–2.484–1.521.6
Relative susceptibility of cotton to wilt.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Agric. Abst. 29 : 8–9.
Almost all Asiatic cottons are highly susceptible to the wilt fungus *Fusarium vasinfectum*. Some commercial varieties, though susceptible, contain some degree of resistance and, on selection yield resistant strains. Such varieties too, if grown on wilt infected soils, shew rapid improvement owing to the early elimination of susceptible individuals.

563. MEGAW, W. J. 633.52:575(41.5)
New pure strains of flax.
J. Min. Agric. N. Ire. 1933 : **4** : 67–71.
Four new pure strains of flax, Stormont Gossamer, Stormont Cirrus, Liral Monarch and Liral Crown have been developed by the Ministry of Agriculture for Northern Ireland and the Linen Industry Research Association with a view to eliminating as far as possible defects such as late ripening, excessive height, liability to lodging and relatively low seed yield ; and in all four strains some of these undesirable characteristics have been eliminated.
In comparative field trials with J. W. S. and commercial varieties, no significant difference as regards yield or monetary value per acre was observed between the four new varieties, but all proved superior to J. W. S. The monetary value of the commercial varieties was 45 per cent. less than that of the pure strains. An arrangement has been made under which it is hoped that substantial supplies of pure strain seed will be produced in Canada for export to Northern Ireland.
Descriptive notes of the new varieties and particulars of another promising strain, Liral Dominion, are given.

564. SINGH, T. C. N. 633.524.1:581.162.5
Sterility in Sunn-hemp (*Crotalaria juncea* L.).
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Agric. Abst. 39 : p. 12.
The various degrees of sterility in Sunn hemp and the accompanying morphological characteristics and anomalies are described. The genetic and physiological aspects of this peculiar form of sterility which appears to be due to " proliferation of the gynoecium into very much branched shoots " are being examined.

565. NOWELL, W. 633.526.2
***Agave amaniensis* : A new form of fibre-producing *Agave* from Amani.**
Kew Bull. 1933 : No. 10 : 465–67.
The taxonomic description, history and properties of a new *Agave* regarded as of possible importance as a fibre producing plant are given.
Though the comparative weights of fibre produced are not yet available there are indications that the percentage of fibre will be somewhat lower than that of sisal. The fibre of *A. amaniensis* is much finer and has about 1½ times the tensile strength of sisal. The length varies from 4 to 5½ feet and when brushed the fibre is lustrous, white to creamy white in colour and has a pleasant soft texture. The strong marginal spines found in *A. Lespinassei* are absent in the new form.

SUGAR PLANTS 633.6

566. DUTT, N. L. and KRISHNASWAMI, M. K. 633.61:575(54)
A note on the breeding of thick type of canes for India.
Madras Agric. J. 1933 : **21** : Abst. 10 : p. 472.
In the systematic breeding of the thick or tropical type of canes, begun in 1926 at Coimbatore, the aim has been to produce types which would cost less to grow, and for this purpose blood of the hardy, thin and medium types has been introduced. Among the 29 seedlings of the thick type distributed up to date, C. 402 and 408 appear to be outstanding. The former gives a good yield and is not prone to flowering, while the latter is a high yielder with a good root system and gives jaggery of superior quality.

567. 633.61:576.16
RAMA RAO PANJE. 633.61:576.312.35
***Saccharum spontaneum* L. A comparative study of the forms grown at the Imperial Sugarcane Breeding Station, Coimbatore.**
Ind. J. Agric. Sci. 1933 : **3** : 1013–44.

The polymorphic species, *S. spontaneum* L., has come into prominence as the result of the discovery by Barber, that it crosses with the sugar cane. The species ranges from southern Europe, through the whole of the tropical and sub-tropical belt of the Old World, to the south sea islands and from sea level to 6,000 feet. Hackel describes three sub-species based on floral characters but, considering its wide range, there is ample justification for postulating ecological forms—an aspect which was studied by Hole.

The present investigation forms a very detailed study of morphological and anatomical characters of the species but is limited to 12 forms, drawn from northern India (Lahore and Dehra Dun), southern India, Bengal, Assam, Burma, Java and Sumatra, which had been grown in some cases for as long as 20 years at Coimbatore. Of Hackel's three sub-species, one occurs only in the Philippines. Between the other two, *indicum* and *aegyptiacum*, the writer finds that Hackel's floral diagnosis does not hold and that they are separable only by their vegetative characters. He also finds no evidence to support Hole's view that habit and mode of growth are influenced by environment.

Of major importance are the characters of ligule, whether deltoid or crescentic; of lamina, whether narrowed at the base, and of the midrib, whether greater or less than half the width of the lamina. By these he distinguishes *indicum* from *aegyptiacum*. Of the former, one form, var. *juncifolium*, has the lamina reduced to the midrib and culms short and further subdivision is based on habit; these forms are all from India proper. The Burma form is characterized by the fact that the internodes generally outgrow the leaf sheaths, while in the Java and Sumatra forms this is not the case. These two are distinguished by the presence (Java, *glagah*) or absence (Sumatra) of stomatal grooves in the leaf.

In view of the fact that Bremer shewed that the haploid chromosome number in the Java form of *glagah* was 56 while that of the form from Celebes was 40 and that Dutt and Subba Rao have recently shewn that the southern Indian form had 32, the desirability of a more detailed investigation of the chromosomal constitution of the various forms is evident. H. M. L.

568. BATHAM, H. N. 633.61:581.145.1(54.3)
Flowering of Coimbatore canes in the United Provinces.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Agric. Abst. 46 : p. 16.

The flowering of sugar canes which is of rare occurrence in northern India is recorded and its cause and its effect on the quantity and quality of the canes are examined.

569. 633.61.0014(96.9)
PRATT, J. S. B. 633.61–2.484–1.521.6(96.9)
Present day status of varieties on irrigated plantations. Reports of the Twenty-fifth Annual Meeting of Hawaiian Sugar Technologists.
Int. Sug. J. 1934 : **36** : p. 57.

During 1933 considerable changes were made in the percentages of area under different varieties. For eye-spot areas 28-3540 is the most favoured cane. The two outstanding new seedlings are 28-1234 and 30-2417. The former is a seedling of POJ 2364 (mother of POJ 2878) x 26–C–270 (Yellow Caledonia x H 109); the latter is derived from 28–674 (a seedling of POJ 2364 x 26–C–270) x H 456 (from H 240 x D 1135). These two have shewn *plus* results under a wide range of conditions. The second is apparently quite eye-spot resistant. Other promising varieties are 28-2055, a full sister of 28–1234; 31–1389, a seedling of POJ 2878 x 26–C–270, and 28–6014 a seedling of Yellow Caledonia and H 109. A list is given of other newer varieties for further testing and of eye-spot resistant varieties.

Mosaic resistant canes, *e.g.*, Uba, D. 1135, POJ 36 and POJ 2878 have replaced the susceptible Tip canes.

570. 633.61.0015(72.8)
Central Cane Breeding Station, Barbados.
Trop. Agric. 1934 : **11** : p. 17.
The discussion on the organization and methods of variety trials and on cane breeding problems for conditions not found in Barbados, at the Advisory Committee Meeting, are briefly mentioned.

STIMULANTS 633.7

571. SALMON, E. S. and WARE, W. M. 633.79–2.42–1.521.6:575
Department of mycology.
J. S.-E. Agric. Coll. Wye 1934 : No. 33 : 17–27.
Work on the resistance of new varieties of hops to "mould" (*Sphaerotheca humuli*) has been continued during 1933 by the Department of Mycology, and several immune male hops of hybrid origin have been discovered and will be used in further crossing experiments.

AROMATIC PLANTS, SPICES, ETC., 633.81/4

572. HAIGH, J. C. 633.8(54.8)
On the identity of some curry stuffs.
Trop. Agriculturist 1933 : **81** : 283–86.
Distinguishing characteristics for identifying a number of curry stuff producing plants that are frequently confused.

OIL PLANTS 633.85

573. ALI MOHAMMAD and ALAM, Z. 633.853.74(54.5)
Types of *Sesamum indicum* D.C. in the Punjab.
Ind. J. Agric. Sci. 1933 : **3** : 897–911.
The Til crop in the Punjab is an admixture of many types and this paper describes the various types isolated from a large collection of samples received from all districts. In the main the classifications of Zaitzev and of Kashi Ram are followed.
The various characters used in the classification are discussed *seriatim* and a key to the **34** types is followed by a description of each type.
Brief notes on flowering and pollination are given and the common visiting insects identified. Natural crossing, as judged by the segregation found in the various cultures, on the 3 years' average, amounted to 5 per cent. H. M. L.

574. 633.855.34(92.1)
MILSUM, J. N. 633.855.34:581.162.3
The oil palm in Sumatra.
Malayan Agric. J. 1934 : **22** : 29–33.
Inter alia seed germination and nurseries and the method of artificial pollination used are briefly mentioned. Considerable importance is attached to planting new areas with palms from seed of known parentage.

RUBBER PLANTS 633.9

575. MURRAY, R. K. S. 633.912
Proved *Hevea* clones, II. Clones in Malaya and the Dutch East Indies.
3rd Quart. Circ. Rubb. Res. Scheme Ceylon 1933 : **10** : 68–78.
A report on the performance in Malaya and the Dutch East Indies of those imported clones that may be of interest to Ceylon planters. The information covers the latest tapping year.

576. CHITTENDEN, R. J. 633.912:581.165.7:575
The asexual propagation of *Hevea*.
Emp. J. Exptl. Agric. 1933 : **1** : 307–15.
In considering seed selection in relation to budding, the author states that sexual and asexual selection of *Hevea* will probably advance together, bud-grafting providing the necessary proved genetic material on which breeding work may be based, and selection from the seedlings produced as the result of hand pollinations supplying the clones of the future. Strains of seed,

it is true, may be evolved which will temporarily replace buddings as planting material, but since the best of these seedlings will be used as bud-parents providing new and better clones, it is unlikely that buddings will be permanently displaced from new plantings, unless or until a pure strain of high-yielding, disease-resistant and vegetatively desirable *Hevea* is attained—a rather remote possibility.
Genetic work must also provide improved strains of stock and to this end various types of clonal seed are being tested.

577. VOLLEMA, J. S. 633.912–1.541(92:1+92.2)
What are our latest views regarding buddings as planting material?
3rd Quart. Circ. Rubb. Res. Scheme Ceylon 1933 : **10** : 79–94.
This is a translation of the paper summarized in Abst. 748.

FRUIT TREES 634

578. LAL SINGH, L. 634:575.42(54.5)
Improvement of fruit industry through bud selection.
Seasonal Notes Punjab Agric. Dept. 1932 : **10** (2) : 39–41.
The organization in the Punjab of a central body like the Co-operative Bud Selection Society of New South Wales (see Abst. 584), is recommended to improve fruit growing in the Punjab by bud selection from progeny trees of known parentage and with high yields recorded for a number of years.

579. SPINKS, G. T. 634.1/7:575(42)
Progress report on fruit breeding.
J. Bath W. S. Co. Soc. 1932–33 : **7** : 163–68.
A report containing information on named seedlings of new varieties of apples, pears, plums, blackcurrant and blackberry produced during the past two years at Long Ashton Research Station, England.

580. GRASOVSKY, A. and WEITZ, J. 634.11(56.9)
Apple growing in Palestine.
Agric. Leafl. Dept. Agric. and For. Palestine 1933 : Ser. IV : No. 30 : Pp. 21.
Local and imported varieties are described and the flowering periods for a number of varieties in Palestine are tabulated.

581. CRANE, M. B. and LAWRENCE, W. J. C. 634.11:575.11
Genetical studies in cultivated apples.
J. Genet. 1933 : **28** : 265–96.
Investigations were made on the inheritance of a number of fruit and other characters in the F_1 of crosses between a large number of varieties, with the following results : ground colour, which ranges from cream, through yellow to green, is probably determined by a number of cumulative factors, with yellow partially dominant or epistatic to green ground colour ; as forms without anthocyanin occur only very rarely a number of dominant factors is most likely concerned in the inheritance of anthocynanin, some of which at least are possibly complementary and cumulative. The inheritance of both flush and stripe is obscure and complicated.
Complementary factors appear to be involved in the inheritance of green-tinged flesh, while there is greater variation in the segregation of cream and yellow flesh colours. There were indications that more than one pair of factors is concerned in the inheritance of the fruit surface characters dry v. greasy.
The results of the investigation on fruit size suggest that a number of cumulative factors is concerned and that small size is dominant to large size.
There was a correlation, which was not universal, between number of seeds formed and fruit shape—also a certain correlation between the mean shape of progeny and parents. Data are given on the flavour of the hybrid fruit by grading the results into five classes from sour to sweet.

There was no sharply discontinuous variation in time of ripening and though the variation of some families exceeded that of the parents, in most cases it was confined to the limits of their extremes.
Albinotic seedlings occurred in two varieties on selfing and among the progeny of a number of crosses, but the results were too complicated and the data too few for definite conclusions. There was correlation between albinism and a high degree of non-viability. The data on the development of root-burrs suggest that this character is due to several recessive factors which are probably cumulative. Low viability of seed in general and lack of vigour of the seedlings from crosses between triploids is found to be associated with the aneuploid condition.
The almost complete lack of discontinuous variation in the inheritance of so large a number of characters lends further support to the assumption that the apple is an allopolyploid.
The significance of the data in relation to the origin and constitution of the apple is discussed.

582. DARLINGTON, C. D. 634.23:576.312.35
Studies in *Prunus*, IV.
J. Genet. 1933 : **28** : 327–28.
Investigations on the somatic chromosome number in the root tips of sweet cherries shewed that 2n=16 and the extra chromosomes previously reported are not present.
From this finding it is deduced that the characters of the sweet cherry shewn by certain varieties raised by Knight in 1814–1818 are not the result of hybridization with sour cherries but are " derived from the range of variation of their own diploid species."
Tetraploid seedlings, however, do occur among the diploid sweet cherries and this is probably the origin of the Dukes which are tetraploid and cross freely with the tetraploid sour cherries.

583. GRUBB, N. H. 634.23–1.541.11:575.2
Cherry stocks at East Malling. I. Stocks for Morello cherries.
J. Pom. Hort. Sci. 1933 : **11** : 276–304.
In considering the relation of stock and scion in cherries of different varieties, seedling stocks of the sweet cherry Mahaleb and especially the acid cherry, obtained from commercial sources, were found to vary very considerably in physiological and morphological characters and in edibility.

584. BENTON, R. J. 634.3:581.165.7:575.42(94.4)
Citrus bud selection. Work of the bud selection Co-operative Society.
Agric. Gaz. N.S.W. 1934 : **45** : 29–30.
The activities of the Society (which was formed in 1928) are directed to ensuring that selected buds from trees which are of the best strain of any particular variety, and have been regularly recorded for 4 years, are available for nurserymen. It is claimed that this work should help towards the standardization of the types of citrus varieties produced.

585. MAHESHWARI, P. 634.441:581.3
The life-history of *Mangifera indica* L.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Bot. Abst. 39 : 11–12.
A botanical study mainly from the embryological standpoint.

586. BISWAS, K. 634.37
Notes on *Ficus indica* Linn. and closely allied American species—*Ficus laurifolia* Hort. et Lam. and *Ficus anthelmintica* Martius.
Current Sci. Mysore 1933 : **2** : 51–52.
Remarks on the systematic position of various species of *Ficus* with some suggestions on their potential economic value.

587. 634.58:575.42
MAHTA, D. N. and JANORIA, D. L. 634.58:575.12
Groundnut as a rotation crop with cotton.
Ind. J. Agric Sci. 1933 : **3** : 917–32.
In addition to the rotation trials, selection and hybridization experiments have been made and pure lines of several types of nuts isolated of which Small Japan, Spanish peanut and a large

podded variety, AK–10 are the best. The last named produces big nuts, is easy to harvest and has a high yield (2,260 lbs. per acre, *i.e.*, nearly 100 per cent more than the Small Japan and Spanish peanut), a fact which compensates for the low oil content which reduces the market value of AK–10.

Recently a new strain of Spanish peanut, AK12–24, has been evolved with large pods and superior to Small Japan in oil content and time of maturity. In yield AK12–24 surpasses both Spanish peanut and Small Japan.

588. JACOB, K. C. 634.771
South Indian bananas.
Madras Agric. J. 1933 : **21** : Abst. 6 : p. 471.

In this paper local varieties of the banana in Southern India are stated to number 400. Particulars were given of vernacular names, morphological characters and chromosome numbers. The possibilities of improvement in future breeding and selection were mentioned.

FORESTRY 634.9

589. 634.97:575
634.97:575(54)
CHAMPION, H. G. 634.97–1.531.12
The importance of the origin of seed used in forestry.
Ind. For. Rec. 1933 : **17** : Part V : Pp. 76.

This compilation of observations on the importance of the origin of seed (*i.e.*, the seed bearer and the locality) used in forestry was prepared as a result of a resolution of the 1929 Silvicultural Conference at Dehra Dun that a summary should be made of the latest European results on the subject.

Visits to European centres, forestry research and an extensive though necessarily and admittedly incomplete bibliography comprising the 150 references consulted, form the background of the present report in which various investigations in progress are referred to and recommendations made for future work.

The wide range of subjects covered in the report includes the effect of size of seed or fruit and of age, size and dominance of the parent tree on the resulting plant ; the inheritance of morphological, phenological and physiological variations and of sports and mutations ; geographical, altitudinal and soil races ; selective breeding and hybridization. A practical and suggestive chapter on the technique of the comparative study of seed origins should prove useful to future investigators.

The Indian standpoint has been considered throughout and a number of hitherto unrecorded observations included. The organization and legislation for authentic seed supplies in Europe and America is touched upon.

Convenient summaries of various chapters are interspersed throughout the text and some excellent photographic illustrations complete the author's difficult task.

590. 634.97-1.531.12
BALDWIN, H. I. 634.97:576.16
The importance of the origin of forest seeds.
Emp. For. J. 1933 : **12** : 198–210.

The question of the origin of seed from forest trees embraces the climatic and physiographical conditions of the location where the seed is collected and also the genetic character of the mother trees.

The origin of the provenance problem is shewn to be due partly to the existence of local races within our tree species and partly to social and economic causes that have brought about a mixture of these races. Evidence of the existence of such races is briefly stated and the economic importance of seed origin pointed out.

591. BROUGH, P. 634.972:581.162
The life-history of *Grevillea robusta* (Cunn.).
Proc. Linn. Soc. N.S.W. 1933 : **58** : 33–73.

A detailed study of organogeny, fertilization, pollination and variation in seed production.

592. JACKSON, A. B. 634.975:575.127.2
A new hybrid pine.
Gdnrs.' Chron. 1933 : **93** : 152–53.
A chance hybrid between *Pinus ayacahuite* and *P. excelsa* produced cones of an intermediate type which was also observable in further seedling progeny of the species hybrid.
The diagnostic characters of the two parent species and of the hybrid which is called *P. Holfordiana* are set forth.

VEGETABLES 635

593. 635.262:576.312.35
RAGHAVAN, T. S. 635.262:576.353
Mitosis in *Allium sativum*.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Bot : Abst. 63 : p. 19.
The somatic chromosome number in *Allium sativum* is 16. A detailed account of chromosome behaviour and structural changes during mitosis is given. The probable role of the nucleolus is inferred from observations on its behaviour in mitosis and cell differentation.

594. SABNIS, T. S. and PHATAK, M. G. 635.44(54)
A preliminary note on the classification of cultivated Indian mustards.
21st Ann. Meet. Ind. Sci. Cong. Bombay 1934 : Sect. Agric. Abst. 45 : p. 16
The cultivated Indian mustards which belong to *Brassica juncea* L., *B. campestris* L. and *B. Napus* L. have been classified and the relevant literature reviewed. Full descriptions of the species and varieties with a key to the types are given with information on their geographical distribution.
Notes on cultivation, flowering and pollination complete the paper.

595. WAGER, V. A. 635.64–2.484–1.521.6:575
Fusarium wilt in tomatoes. Research work in the Eastern Transvaal.
Fmg. S. Afr. 1934 : **9** : 61–63.
After four seasons of selection for resistance to *Fusarium* wilt the tomato varieties Marvel and Stone have attained a high degree of resistance and seed has been distributed to farmers for trial purposes. Breeding and selection is to be continued with the same two varieties and also other resistant varieties from U.S.A. are to be tested.

596. RANGASWAMI AYYANGAR, G. N. and KRISHNASWAMY, N. 635.65:576.312.35
A note on the chromosome number in cluster beans, *Cyamopsis psoralioides* D.C.
Ind. J. Agric. Sci. **1933** : **3** : 934–35.
The determination was made on the pollen mother cells of buds 2 mm. in width and 3 mm. in length in five varieties and the haploid number found to be 7. In a few cells of the ovary wall counts were possible and the diploid number was found to be 14.
This number is in agreement with that of members of the *Vicieae*, but *Dolichos* and *Phaseolus*, which supply species with edible pods, have basal chromosome numbers of 11 and 12. There appears, therefore, little chance of improving the Cluster Bean by crossing with species of the *Phaseoleae* group. H. M. L.

597. MCRAE, W. and SHAW, F. J. F. 635.659–2.484–1.521.6
Influence of manures on the wilt disease of *Cajanus indicus* Spreng. and the isolation of types resistant to the disease. Part II. The isolation of resistant types.
Sci. Monograph. Imp. Counc. Agric. Res. 1933 : No. 7 : 37–68.
Particulars are given of selection in progress since 1923 for resistance of *Cajanus indicus* Spreng. to *Fusarium* wilt. A form designated Type 80 proved highly resistant and Types 16. 41. 50, 51 and 82 were also resistant. No correlation was found between morphological characters and resistance.
A loss of resistance noted in a resistant type grown in a field that had been under the crop for several years was not transmitted to the next generation.

Part II. Foreign

STATISTICS 519

598. LAUPRECHT, E. and MÜNZNER, H. 519.24
Über die richtige Gewichtsbestimmung bei Zusammenfassung von einzelnen arithmetischen Mitteln zu einem Gesamtmittel. (**On the correct system of weighting in combining a number of arithmetic means into a general mean**).
Züchter 1933 : **5** : 281–84.

It is pointed out that the weights of observations of unequal precision must be taken into account in forming a mean. In particular the weights of a number of means to be taken together must be inversely proportional to their variance, *i.e.*, directly proportional to the number of observations n, or to $n/\{1 + (n-1)r\}$ if intercorrelated. A false system of weighting may easily be worse than none at all. An example is provided from milk production improvement through "grading up" the herd. J. W.

599. SNEDECOR, G. W. and IRWIN, M. R. 519.24
On the chi-square test for homogeneity.
Iowa St. Coll. J. Sci. 1933 : **8** : 75–81.

When a simple alternative is considered, as for example when the proportion of individuals in a sample having a given character is determined, it is often desired from a number of such samples to find out whether the incidence of the character in question is stable or not. This is done by means of a test of independence, and the present is the special case of a $2 \times n$ classification, for which formulae have been given in the past. In this paper a new formula is given which has manifest advantages over others previously employed, and illustrations of its use are provided. J. W.

600. IMMER, F. R. 519.24:575.116.1
Calculating linkage intensities from F_3 data.
Genetics 1934 : **19** : 119–36.

Following on previous work of the author (See "Plant Breeding Abstracts," Vol. I, Abst. 30) the present paper continues the study begun by Fisher of the problems arising when F_3 data are utilized to determine the F_2 genotypes. Formulae are worked out for estimating the linkage intensity from F_2 data when two of the four classes are indistinguishable. The manner in which data from F_3 progenies, of selfed F_2 plants, may be used in calculating linkages is illustrated. Examples from F_2 and F_3 data of various kinds are given. The standard error to be attached to the crossover percentage is calculated from the total amount of information.
J. W.

GENETICS 575

601. 575
Thomas Hunt Morgan—der Nobelpreisträger für Medizin 1933. (**Thomas Hunt Morgan—Nobel Prizeman for Medicine, 1933**).
Züchter 1933 : **5** : 257–60.

An outline of the life and work of T. H. Morgan with a bibliography of his main works on genetics and developmental physiology.

602. OEHLKERS, F. 575
Vererbung. (**Inheritance**).
Fortschr. Bot. 1933 : **2** : 259–74.

This report, the second of a series of annual surveys of research on genetics, contains a general summary of the work accomplished during 1932 on tetrad analysis, linkage and the role of the plasma in inheritance. An account of research on mutations and other more specialized investigations during the same period is reserved for the next volume.

603. ROEMER, T., TSCHERMAK E. v. and HUSFELD, B. 575
Erwin Baur.
Z. Zuchtung 1934 : A. **19** : 3 pp.

Obituary notice of Professor E. Baur.

604. RAVE, L. 575:578.08
Leica–Reproduktionsverfahren und Pflanzenzüchtung. **(The Leica photographic reproduction process and plant breeding).**
Züchter 1933 : **5** : 260–62.
A description with illustrations of a new extension which can be fitted to the lens of the Leica camera, (see " Plant Breeding Abstracts " Vol. IV Abst. 354) and will enable good definition and sharp outline to be obtained in photographs taken at close range.

605. WANNER, E. 575:578.081
Die " Zähluhr." **(The " watch-reckoner ").**
Züchter 1933 : **5** : 262–63.
The appliance which is described as a " recording watch " could be used in various operations necessary in plant breeding, such as reckoning the number of diseased ears, of wrinkled seeds, etc. It is claimed that with practice the counting process becomes automatic and errors are almost excluded.

606. 575.17
575.24
DEMEREC, M. 576.16
What is a gene?
J. Hered. 1933 : **24** : 369–78.
The evidence is outlined upon which, as a working hypothesis, the gene is regarded as an ultramicroscopic organic particle resembling in its structure a single complex organic molecule, though a multi-molecular structure would not invalidate the main theory. The location and linear arrangement of genes and the relative nature of the stability of genes are discussed.
As regards the nature of gene changes the evidence that is being obtained from the rate of change in unstable genes from the direct effects of X-rays suggests that gene changes are chemical processes. Moreover, the observed phenotypic effects of multiple allelomorphs suggest that slight but mutually independent changes in the gene molecule are regarded as the cause of the occurrence of the different allelomorphs. The lethal effects of X-rays are probably attributable either to chromosome deficiencies or as is more likely to the elimination of a single gene, the elimination process constituting either a direct destruction of the gene or loss of the power of reproduction by the gene.
A gene molecule can stand but very slight change and any radical change eliminates the gene from the gene complex and the elimination of a single gene (with certain exceptions) has a lethal effect. Hence a full complement of genes is apparently necessary for the life of an organism or even the proper functioning of a cell. The primary function of a gene is not the determination of a visible characteristic but the regulation of the life processes of the cell.
The potential role of the sterility due to gene differences between two lines, in species formation is mentioned. Evolutionary progress may occur through mutations accompanied by coincident extensive changes in the environment of a species which necessitates a new adjustment in the gene complex. Evolution may also be possible through additions of new loci to a gene complex, leading ultimately to the formation of a new species.

607. 575.17:575.113
CASTLE, W. E. 575–181
The gene theory in relation to blending inheritance.
Proc. Nat. Acad. Sci. Wash., 1933 : **19** : 1011–15.
In general it is the more fundamental and essential characters of organisms that blend in inheritance, whereas the more superficial and less important characters distinguishing individuals as opposed to species, genera, etc. mendelize.
Nilsson–Ehle's multiple factor interpretation of blending inheritance is examined in the light of evidence from animal embryology and from work on plasmatic inheritance in plants. The author holds that though the size of an organism may be influenced by chromosomal genes, it is not proved that size is regulated exclusively by the action of genes. The cytoplasm appears

to offer a suitable mechanism for the inheritance of blending characters, the chromosomes acting as potential modifiers of the general organization characteristic of the species and present in the cytoplasm before the fertilization. The possibility of the sperm too introducing cytoplasm into the egg is considered. In the author's opinion there is reason to believe that the general organization is primarily plasmatic and is derived either from the mother alone, or from both parents if the sperm contains cytoplasm.

On this view racial differences in body size might be due in part to plasmatic differences and in part to gene differences but the increased variability of F_2 as compared with F_4 would be due to gene differences alone, since blending of plasmas would presumably be as complete in F_2 as in F_1.

Differences in reciprocal crosses between large and small-bodied races should provide a test of the plasmatic nature of size inheritance.

608. GOLDSCHMIDT, R. 575.17:575.182
The influence of the cytoplasm upon gene-controlled heredity.
Amer. Nat. 1934 : **68** : 5–23.

The subject matter for this critical and stimulating presentation of the evidence bearing on the influence of the cytoplasm on gene action has been drawn from research in plant and animal organisms and includes Goldschmidt's most recent findings on cytoplasmic influence upon sex determination in *Lymantria*.

The general conclusion is that a distinctive cytoplasmic influence on the action of genes in controlling hereditary traits has been found in many instances and this influence appears to increase, the wider the taxonomic differences in the cross become. It has not yet been decided whether this influence is purely cytoplasmic or under the control of genes in the form of *Dauermodifikation* phenomena. A special role is assigned to plasmatic influence in sex determination.

A selected biography completes the address.

609. NAVASHIN, M. S. 575.24
(New data on the origin of spontaneous mutations).
Biol. J. Moscow 1933 : **2** : (2–3) : 111–15.

An account of this work was published in English in Nature, 1933, and has already been reviewed (see " Plant Breeding Abstracts," Vol. III, Abst. 552).

610. 575.24:581.149
CARTLEDGE, J. L. and BLAKESLEE, A. F. 576.12:575.24
Mutation rate increased by aging seeds as shown by pollen abortion.
Science 1933 : **78** : p. 523.

A definite influence of age on seed on the number of mutations in *Datura stramonium* was found, pollen abortion being used as an index of the mutation rate. Gene and chromosomal mutations were observed in approximately equal numbers and the mutations increased by about 1 per cent per year. While on the whole the percentage of germination was lowest in the oldest seeds, this percentage varies considerably among the progenies of individual parents within each age group, and seems to bear no close relation to the number of mutations thrown. The increase in the number of mutations was not due to selective elimination of normals nor to any unusual source of radiations.

This confirmation of the experiments of Navashin and Shkvarnikov (see " Plant Breeding Abstracts," Vol. IV, Absts. 1 and 82) has obviously a possible bearing on the problem of evolution in nature.

611. MUDRA, A. 575.243
Despre provocarea mutatiunilor. **(On the production of mutations).**
Viaţa Agric. 1933 : **24** : 445–52.

A brief account of the methods for the artificial production of mutations, the types of mutations, chromosomal or factorial, and their practical value.

612. Breslavetz, L. 575.243:578.08
Apparat zur Hervorrufung von Mutationen bei Feldversuchen "Inmut."
(The "Inmut" apparatus for inducing mutations in field experiments).
Z. Züchtung 1934 : A. **19** : 120–23.
A simply constructed apparatus suitable for use in the field for the purpose of inducing mutation by the action of narcotics on flower buds has been tested with peas and *Nicotiana tabacum* and the results obtained will form the subject of a later report. Any suggested improvements will be welcomed.

613. Mendiola, N. B. 575.25:578.088
A method of plant improvement based on the use of hidden heritable bud variations and those produced through injury.
Philipp. Agric. 1933 : **22** : 465–508.
It is well known that the development of buds may be stimulated by injury and it is pointed out that the majority of the plants in which bud sports have been recorded are propagated vegetatively. It is therefore argued that by increasing the methods of vegetative propagation, both in range and degree, latent variations may be brought to light which may prove to be of practical value.
A bibliography of 6 pages is appended.

614. Baur, E. 575.4
Die Bedeutung der natürlichen Zuchtwahl bei Tieren und Pflanzen. **(The significance of natural selection in the plant and animal kingdoms).**
Schriftenreihe des Reichsausschusses für Volksgesundheitsdienst Berlin 1933 : No. 3 : pp. 12.
The well-known facts about the origin of genetic variation by hybridization and mutation and the influence of environment acting upon a population of variants are stated and exemplified by reference to plants and animals. If natural selection prevails the best adapted types will automatically survive, whereas under artificial selection variants will be maintained that under wild conditions would be incapable of survival.
Man too is subject to these same laws and eugenic measures are therefore essential if racial degeneration is to be prevented.

EVOLUTION 576.12

615. 576.12
Goldschmidt, R. 576.16
Some aspects of evolution.
Science 1933 : **78** : 539–47.
Some of the ways by which nature makes possible the transformation of species are considered, and experimental evidence is adduced to shew that the formation of sub-species or geographic races is not a step towards the formation of species but only a method to allow the spreading of a species to different environments by forming preadaptational mutations and combinations of these, which, however, always remain within the confines of the species. The significance of the methods of normal embryonic development for an understanding of possible evolutionary changes is emphasized and it is suggested that a directed, orthogenetic evolution is a necessary consequence of the embryonic system which allows only certain avenues for transformation. Attention is drawn to the role of those mutations which though rare may profoundly influence the whole organism by affecting rates of decisive embryonic processes and thereby possibly giving rise to forms which, though monstrosities, may be capable of starting a new evolutionary line under certain environment.
Some recent genetic research on the problem of mutation with its bearing on evolution is also mentioned.

616. 576.12
Osborn, H. F. 575.4
Recent revivals of Darwinism.
Science 1933 : **77** : 199–202.
The author's views on evolution with remarks on various classic theories of evolution.

617. NAVASHIN, M. 576.312.36:575.127
Chromosome alterations caused by hybridization and their bearing upon certain general genetic problems.
Cytologia 1934 : 5 : 169–203.

This report on experiments carried out with *Crepis* species from 1928–30 deals mainly with the occurrence and types of amphiplasty which may be defined as the alterations in the individuality of species chromosomes under the conditions of a common hybrid cell in interspecific crosses. In some such crosses the chromosomes are unaffected, in others a satellite may " disappear " or the chromosomes become shorter and thicker than in the parent species. Since reciprocal crosses gave the same results the changes observed are not due to any cytoplasmic differences of the two species crossed but to the dual constitution of the hybrid nucleus composed of specifically different haploid chromosome sets and their mutual influence upon each other. Amphiplasty is of two kinds (1) sporadic and (2) regular. The first form which will be the subject of a separate paper is characterized by its chance occurrence and includes chromosome changes such as the dislocations of various types frequently found in hybrids. Regular amphiplasty comprises two apparently unconnected though often coincident forms, *viz.* (*a*) differential and (*b*) neutral.

Out of 21 interspecific combinations 13 exhibited differential amphiplasty consisting in the " disappearance " of the satellite from a chromosome of one of the parent species owing to the fusion of this satellite with the proximal end of its chromosome. The phenomenon is unaffected by polyploidy. The causal factor is unknown but the "disappearance" has been shewn not to be due to general shortening of the chromosomes.

Neutral amphiplasty is expressed by a general contraction or lengthening of all the chromosomes of a species entering a cross. Moreover the changes within a specific set are always in the same direction. Thus in the cross *C. capillaris* x *C. neglecta* all the *capillaris* chromosomes were lengthened and the *neglecta* chromosomes shortened. In no case were the changes in both species in the same direction.

No consistent evidence was found to shew that the hybrid conditions affected the variability in chromosome length.

Pronounced amphiplastic changes in chromosome volume were also found, the chromosomes of some species being larger and of other species smaller in certain hybrid combinations.

The possible implications of these findings and their bearing on the modifications in appearance and behaviour of the chromosomes in relation to mutual influence between the cellular medium and the chromosomes are discussed and certain evolutionary aspects of the problem are touched upon.

Observations on technique (*e.g.*, chromosome measurements, etc.) and the selection of suitable experimental material are also included.

There is also a short appendix (written in 1934) dealing with Darlington's views on changes in chromosome bulk.

618. JEFFREY, E. C. 576.354.4
Comparative investigations on the reduction division.
Amer. Nat. 1934 : 68 : 77–78. (Abst.).

The present unsatisfactory state of our knowledge of the phenomena of meiosis is attributed firstly to the fact that conclusions are frequently the result of compilation rather than actual comparative observations and secondly to the selection of material with large and conspicuous chromosomes during meiosis.

Favourable material for study, in which the chromatin in the meiotic stages is not too abundant, may be found in many families of the dicotyledons and the conifers. A study of chromosome behaviour in these groups would seem to indicate that many existing chromosome hypotheses such as those relating to synapsis and syndesis in meiosis need fundamental revision.

The views defined by the author imply a complete parallelism between the essential features of karyokinesis in both somatic and reproductive cells, the only essential difference being that the continuous spireme in the somatic divisions is segmented into twice as many chromosomes as in the reproductive divisions.

619. HÜTTIG, W. 576.354.4:581.02
Über den Einfluss von Aussenbedingungen auf die Chromosomenreduktion. (Sammelreferat). [**On the effect of external conditions on chromosome reduction. (General survey of literature.)**]
Züchter 1933 : **5** : 243–49.

The general effects of temperature on chromosome reduction in potatoes, apples and other plants are outlined. The effective degree of temperature is regarded as evidently specific for various species.

The dependence upon temperature of the time at which chromosome reduction occurs is exemplified by the work done on species of *Ustilago*. The effect is attributed to the action of temperature on the phenomena incidental to cell enlargement and on the colloidal structure of the nuclear proteins. Bleier's research on the pre-equational longitudinal splitting of the chromosomes (*i.e.*, during the first telophase) in wheat as a temperature reaction is mentioned.

The profound disturbances due to the effects of Röntgen rays on the reduction division in wheat are also attributed to changes in the colloidal structure of the chromatin.

The influence of narcotics on reduction has also been studied in the lower plant forms since 1904 and various inhibitory effects have been observed. Hüttig's investigations, however, on the influence of urethane upon reduction meiosis in *Ustilago Avenae* demonstrated for the first time a reaction limited to one direction only, for pre-reduction was entirely excluded as a consequence of the treatment. In this instance the inhibitory action was intensified in direct proportion to the number of carbon atoms in the molecules of urethane and at the same time an increase in the sensitivity of the fungus to the concentration of the narcotic was also observed.

In view of the observations of physiologists on the action of the Hofmeister series of salts on colloids and on protein compounds in particular, Hüttig was led to study the effects of these substances upon the time at which reduction occurs in *Ustilago Avenae* at a constant temperature; and the chemical aspects of the resultant changes in the time of reduction are discussed, though the nature and cause of this disturbance are not yet known.

620. PROPACH, H. 576.354.46:575.116.12
Fortschritte der Cytologie in der Austausch-und Konjugationsfrage. (Sammelreferat.) [**Progress in the cytological investigation of the problem of crossing-over and conjugation. (General survey of literature.)**]
Züchter 1933 : **5** : 249–57.

A critical discussion dealing mainly with Darlington's views on crossing-over and conjugation as presented in " Recent Advances in Cytology " (see " Plant Breeding Abstracts," Vol. III, p. 39). The work of American investigators is also considered in passing.

The author awaits a demonstration of Darlington's theory by genetic experiment and suggests that as experimental material some organism with very strictly localized chiasmata should be used, so that it could be shewn that chiasma formation and genetic crossing-over actually coincide. Another method of solving this problem would be the exact analysis of chiasma formation of hetermorphous gemini, differing in as large a number of characters as possible.

621. SAX, K. 576.354.46:575.116.12
Interlocking as a " demonstration " of the occurrence of crossing-over.
Amer. Nat. 1934 : **68** : 95–96.

A case of chromosome interlocking in *Lilium* previously presented by Mather as evidence of the partial chiasmatypy theory of chiasma formation and crossing-over is critically considered and other evidence based on examination of 1,000 bivalents in *Tradescantia* shews that distal interlocking was comparatively rare and thus supports the classical theory of chiasma formation. In the author's opinion the " demonstrations " of the mechanism of crossing-over so far presented by Mather, Darlington, and others, are valid only if the unproved assumptions regarding chiasma formation are correct.

622. 577.8:576.312.332
633.79:576.312.332

WINGE, Ö.

The nature of sex chromosomes.

Proc. 6th Int. Cong. Genet. N.Y., 1932 : **1** : 343–55.

Evidence derived from the sex phenomena in the fish *Lebistes* and in *Humulus lupulus* and *H. Japonicus* is brought forward to shew that cytological observations and genetic experiments substantiate the view not only that the sex chromosomes are to be regarded as originating from the autosomes, but also that X chromosomes can be experimentally changed into autosomes and autosomes into X and Y chromosomes, and finally that under certain conditions the difference between X and Y is merely quantitative.

623. YAMPOLSKY, C. 577.8:576.312.332

Sex and chromosomes in plants.

Bull. Torrey Bot. Cl. 1933 : **60** : 639–55.

Conflicting evidence has been brought forward from time to time on the correlation between sex expression and the presence of a particular chromosome.

In the author's opinion alternative sex inheritance can be described in terms of heterochromosomes provided that opposite sexes are in question ; but in plants dioecism though widespread is not universal and also in the flowering plants a large number of sex forms too exist. It is therefore difficult to see why one sex form, *viz.*, dioecism, should be correlated with the presence or absence of a particular chromosome, how hermaphroditism (also a sex condition), monoecism and other sex categories can be brought into line with the sex chromosome theory. Furthermore, that dioecious plants alone should exhibit a correlation between quantitative differences in chromosome number and morphological differences in males and females and also that some dioecious plants should display no such correlation require explanation.

The presence of sex chromosomes in liverworts is not comparable to the presence of such bodies in flowering plants since in the former sex determination is associated with the reduction divisions —*i.e.* the period when maternal and paternal complements separate.

Moreover, the case for obligate maleness or femaleness with no possibility of sex reversal in the liverworts, mosses and ferns is weakened by certain cases of intersexuality in liverworts, pointing to fluidity of sex expression, and also by the fact that in dioecious mosses and certain ferns mixed sexuality occurs and the effects produced by factors determining gametophytes of one sex are at least not absolute since transitions from one sex to the other occur.

Contrasting the liverworts in which sex chromosomes have been reported with those in which they have not been observed, no direct evidence emerges to shew that x and y chromsomes in liverworts control sex. If they have any significance it is indirect ; they accompany sex but do not control sex determination.

The cytological evidence of digamety in flowering plants is criticized on the grounds of technique and of possible misinterpretation of the phenomena. The evidence in support of the relation between sex and sex chromosomes, and between cell form and function on the one hand and the chromosomes on the other is stated to be circumstantial. The conception of sex as an expression of alternative inheritance is untenable in view of the normal occurrence of intersexuality in all its various degrees to which there are no corresponding intermediate chromosomes between x and y.

From the author's investigations of *Mercurialis annua* he was unable to single out a chromosome which seemed to be responsible for sex determination. Subsequent evidence also led him to conclude that certain instances of variability in sex expression previously regarded as sex linked have now been explained in terms of autosomal influences.

Until a direct relationship can be established between chromosomes and form and function, it is not justifiable to ascribe particulate inheritance to the chromosomes.

624. ALTENBURG, E. 577.83

A theory of hermaphroditism.

Amer. Nat. 1934 : **68** : 88–91.

Hermaphroditism according to the author's view represents a very efficient mode of distribution of the reproductive " load " (*i.e.*, the energy expended in the reproductive processes, such as

pollen formation) in organisms that are stationary or sluggish and that expend less energy on the male than on the female reproductive products.
Examples in support of this opinion are drawn from the plant and animal kingdoms and a role is assigned to natural selection in rendering hermaphroditism prevalent in organisms of the type in question.

BOTANY 581

625. Borodin, D. N. 581.143.26.03
Jarovization formulas for winter oats and barleys.
Amer. J. Bot. 1933 : **20** : 677–78. (Abst.)
The jarovization (*i.e.*, vernalization) formula which is represented by the predetermined combination of three factors, moisture, time and temperature, indicated in a ratio of A : B : C in which A is moisture p.c. per dry weight of seeds, B, time of treatment in days, and C, temperature (centigrade) was determined for each of 35 varieties of oats and 50 varieties of barley.
The five types of response observed for both cereals are defined. The jarovization formula or pre-sowing treatment necessary to produce the jarovization effect is specific for any one variety. Plants of winter oats grown from treated seeds are less subject to infection by crown rust (*Puccinia coronata*). The acquired properties of the seed were unaffected by a train journey of 1,979 miles, lasting seven days.

626. Piescu, A. 581.143.26.03
Jarovizaţia.—O metodă de accelerare a vegetaţiei. (**Vernalization. A method of accelerating growth.**)
Viaţa Agric. 1933 : **24** : 349–55.
A brief exposition of Lyssenko's work.

AGRICULTURE 63

627. 63.0015(62)
Legros, J. 633:575(62)
Agricultural experimentation in Egypt.
Int. Rev. Agric. Rome 1933 : **24** : 511–17.
In Egypt agricultural research is under the control of various organizations including the Botany and Plant Breeding Section of the Ministry of Agriculture, the Royal Agricultural Society and the Cotton Research Board.
The work of the Botany and Plant Breeding Section situated at Giza relates mainly to cotton—the production of new varieties, the improvement of methods of cultivation, the selection of new strains and the maintenance of direct contact with the important cotton growers.
The Technical Section of the Royal Agricultural Society controls the Bahtim Experiment Farm where, among other activities, plant breeding and the propagation of cotton, wheat, and maize are carried on. Field demonstrations, agricultural shows and the distribution of circulars form part of the propaganda work.
The Cotton Research Board acts as a liaison organization between the various administrations concerned in cotton investigations. It thus provides a means whereby general consideration on broad lines of problems of cotton cultivation may be attained and also new information and discoveries conveyed to those administrations that may be interested. A large library and a Laboratory Research Committee, including all research workers in the various laboratories, and the supervision of various publications reflect the activities of the Board.

PLANT DISEASES 632

628. Gowen, J. W. 632–1.521.6:575.11
On the genetic structure of inherited constitution for disease resistance.
Quart. Rev. Biol. 1933 : **8** : 338–47.
A study of the inheritance of disease resistance of animals and plants shews that resistance depends primarily on the possession by the host of genetic factors (usually a number of independent factors) and on the genetic constitution of the attacking organism. Different factors for resistance to each disease are necessary.

629. LEVINE, M. N., COTTER, R. U. and STAKMAN, E. C. 632.452:576.16
The production of an apparently new variety of *Puccinia graminis* by hybridization on barberry.
Phytopathology 1934 : **24** : 13–14. (Abst.)
Artificial crosses made in the greenhouse between *P. graminis secalis* 7 and *P. graminis tritici* 21, and also between *P. graminis secalis* 7 and *P. graminis tritici* 101 gave similar progeny in both cases; lines were obtained that attack certain varieties of barley normally but not the other cereals and might therefore be regarded as a variety. There is some evidence that *P. graminis tritici* 34 x *P. graminis agrostidis* produced a rust similar to the above.

630. SANDU–VILLE, C. 632.452–1.521.6(49.8)
Aspecte ale problemei ruginii grâului. (**Some aspects of the problem of wheat rusts.**)
Viaţa Agric. 1933 : **24** : 212–23.
A short account of the wheat rusts and methods for their control with special reference to Rumania.

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631. RATHER, H. C. 633(77.4)
Crop varieties for Michigan.
Sp. Bull. Mich. Agric. Expt. Sta., 1932 : No. 109 : pp. 24.
The methods of crop improvement at Michigan Experiment Station, distribution of new varieties, maintenance of purity and improved seed distribution in the State are outlined, and new varieties of barley, beans, buckwheat, maize, millet, oats, potatoes, peas, rye, soya beans, wheat and other crops are described with recommendations to growers.

632. 633:575
Walter Busse.
Züchter 1934 : **6** : p. 19.
Obituary notice.

633. BAUR, E. 633:575(43)
Bericht über den Stand der wichtigsten Züchtungsarbeiten im Kaiser-Wilhelm-Institut Müncheberg. (**Report on the state of the most important breeding investigations at the Kaiser-Wilhelm Institute Müncheberg.**)
Deuts. landw. Pr. 1933 : Nr. **34** : pp. 5.
A progress report on the work that is being done with potatoes, cereals, protein fodder plants, oil plants, vines, fruit, vegetables, forest trees and meadows.
To combine on the one hand resistance to *Phytophthora* and to wart disease with good yield and other desirable tuber qualities and on the other hand frost resistance with high quality are the two main objects in the potato breeding experiments.
Barley breeding is directed in the winter types towards increasing winter hardiness and resistance to lodging and in the spring types to the production of reliable forms as regards yield and a good naked barley for brewing purposes.
The main aim in regard to wheat is the production of types that are winter hardy, of high baking quality and hardy as regards soil conditions. Intergeneric crosses have so far given no outstanding results.
Efforts are being made by inducing self-pollination to obtain varied material for selection with a view to developing a short-strawed rye. Perennial rye strains from a Petkus x Anatolian wild rye cross giving a good yield of grain are being tested in large numbers, and may ultimately prove valuable as fodder.
A suggestion is put forward that the bitter lupin should be replaced by the sweet lupin and other Leguminosae as a source of plant proteins for fodder purposes.
Breeding work is also being directed towards the production of fodder plants of suitable fat content to reduce the high imports of oil cake, etc., into Germany.

The primary object of the extensive vine breeding operations in progress is the production of a variety equal in quality to the best German grapes and completely resistant to *Peronospora*, and also as resistant as possible to Roter Brenner (*Pseudopeziza tracheiphila*) and true mildew. Breeding experiments are also being carried out in hopes of developing high quality stocks and good mildew resistant direct producers.
From the cross and self-pollination of apple trees 30,000 seedlings have been raised. It is hoped to obtain *Fusicladium* resistant types of apples and pears as well as valuable commercial types. Similar work is being done with cherries, plums, peaches and apricots.
Earliness is the chief aim in vegetable breeding and in tomato breeding in particular a combination of earliness with good keeping properties is hoped for from certain crosses that are being tried. A mildew resistant, large berried gooseberry will probably soon be ready for distribution to growers and some new forms from gooseberry x currant and raspberry crosses may follow.
The main object as regards forest trees is to evolve races of pines that are resistant to leaf cast and one such race has been under test for several years. From crosses with poplars it is hoped rapidly growing and well developed types may be obtained.

634. Baur, E. 633:575(43)
Nationalwirtschaftliche Aufgaben und Möglichkeiten der Pflanzenzüchtung. (**The nation's duty and the economic possibilities of plant breeding.**)
Arch. deuts. LandwRat. **1933** : **51** : pp. 14.

This paper which reviews slightly more fully the work described in Abst. 633 deals with the possibilities of plant breeding as a means of counteracting the existing economic situation in Germany that has arisen owing to the over-production of certain agricultural crops and the under-production of others. The following additional information bearing on lupin breeding is of interest :—
The large imports of feeding stuffs containing proteins and fats could be reduced by extending the cultivation of the sweet lupins developed some years ago by plant breeders who are now also devoting their attention to the production of these lupins with a high fat content almost equal to that of the soya bean. In the meantime other plants too, such as turnips, flax and possibly rape and a suitable variety of soya bean should be tried as sources of fats.
The absolute necessity of adequate financial support for plant breeding research in Germany is stressed.

635. Nicolaisen, W. and Isenbeck, K. 633:575(43)
Probleme, Methoden und Ergebnisse der Pflanzenzuchtstation der Universität Halle. (**Problems, methods and results of the plant-breeding station of the Halle University.**)
Kühn-Archiv **1933** : **38** : 306–77.

A necessarily condensed account of the work done and in progress since systematic breeding on a large scale was undertaken in 1913.
The methods used for breeding and selection, the technique for cultivation and the estimation of the results are described.
The progress in increasing the winterhardiness, quality and resistance to lodging and disease is noted for each of the cereal crops, as well as the aims for the improvement of peas, and of some root crops and forage plants. In winter wheats the use of wheats of the English Squarehead type for breeding while increasing the yield and straw stiffness considerably reduced the quality and winterhardiness of the progeny. To improve the latter therefore, some of the very winter-hardy Swedish varieties were used and such German sorts as Carsten V, Janetzkis and General v. Stocken.
It is hoped that by means of crosses with the American varieties, Buffum, Minhardi and Kharkof which, though very winterhardy, have weak straw and are susceptible to rust, it may be possible to produce forms suitable to very light soils. German wheats which included Squarehead types among their parents were already fairly resistant to lodging and the use of the Swedish varieties to increase the winterhardiness has further improved their straw stiffness so that Heine III and Strain 1274/29 now surpass all other German varieties in this respect.

The French varieties that are very short-strawed and resistant to lodging such as Vilmorin 23, Hybride à Courte Paille, Providence, Prolifique Nain, etc., are especially valuable for crossing with winterhardy German forms for the production of still shorter strawed, more winterhardy and higher yielding types.

Until it was quite definitely established that baking quality was heritable and Pelshenke discovered a method for testing small samples of flour, breeding for quality did not make much progress. As quality is very dependent on such external factors, as climate and soil, it is not enough to have a variety with as good a baking quality as "Rimpaus früher Bastard" which shews great variations in different districts, but it should be possible to breed varieties whose quality is still good under unfavourable conditions. Further, some of the old land varieties and the American winter and spring wheats (Tenmarq, Marquis, Reward, etc.), are being used for crossing.

For resistance to yellow rust, crosses have been made with Chinese 165 x Panzer and Chinese 166 x Strubes Squarehead strains whose progeny have shewn good winterhardiness and satisfactory yield, combined with almost complete immunity to yellow rust. Though it is susceptible in the greenhouse, Ridit wheat has a high resistance to most of the German races of yellow rust and has been used for crossing. Several of the strains from these crosses have shewn resistance to yellow rust as well as good winterhardiness, good resistance to lodging and good yield. In one case resistance to bunt and a good baking quality was also found.

The varieties Varonne and Ardito have been found to be nearly immune to the races of brown rust present in Germany, but they have to be crossed to improve their winterhardiness. "Rimpaus früher Bastard" and still more Heine I and II shew a remarkable field resistance to German races of brown rust. The first and last varieties have been extensively used in crosses with the result that the Institute now possesses a number of lines which even if not immune have a satisfactory field resistance to brown rust.

In breeding for resistance to bunt either the progeny of a number of crosses is infected each year with spores of *Tilletia* and the susceptible plants subsequently removed and selection made for other characters when homozygosity is nearly obtained, or from crosses with Ridit and the cross Heils Dickkopf, x Mettes Schlossweizen, first the suitable forms are selected and then tested for bunt resistance. By the latter method several lines have already been found that for many years have proved themselves resistant. For earliness, "Rimpaus früher Bastard," itself one of the earlier German wheats, is used for crosses. Carsten V x 47/26 has produced some very early ripening lines and much hope is placed in Ridit crosses.

The spring wheat Peragis, from the cross "Blauer Dame" x "Grüner Dame," two American spring wheats, possesses a straw stiffness never known before in spring wheats. In a number of recent crosses, however, 80 per cent. of which have Peragis as one parent, the straw stiffness of Peragis has been surpassed. From a cross between Heines Kolben x R1004 (a selection from a winter wheat) very short, stiff, early forms have been developed, some of the progeny of this and another cross shewing transgressive segregation.

Various crosses have been made to improve the baking quality of German spring wheats ; the progeny of many shew a very satisfactory improvement.

Forms resistant to yellow rust and also to brown rust and with the straw stiffness of Peragis from the cross Normandie x Peragis have been isolated.

A number of crosses of various varieties including Peragis, Normandie, Ardito, Varonne and Madonna (*durum*) have been made to obtain forms resistant to brown rust, but definite results are not yet available.

As there appears to be no spring wheat resistant to bunt, recourse has been made to winter varieties. A strain has been isolated from the cross Peragis x Fürst Hatzfeld which, besides being resistant to bunt and lodging, yields well. To improve its earliness it has been crossed with the earliest spring wheats.

A number of crosses are described which have produced progeny immune or resistant to smut and combining in some cases resistance to rust and other valuable characteristics. For earliness, Peragis has been crossed with Garnet, Marquis and some German varieties. From the first two crosses forms have been produced which ripened 14 and 12 days earlier than Peragis.

Not much rye breeding is done, but a short strawed form has been produced, named Binder

rye which can be harvested with a binder. It has yet to be tested on the light soils on which rye is usually cultivated.

In barley the ideal combination would be higher yield and reliability of yield, winterhardiness, earliness, resistance to lodging, smooth awns, naked grain, higher protein content for forage barley, immunity to smut and *Helminthosporium*, no germination in the ear, brewing quality and compatibility for light and acid soils. A large number of crosses of both winter and spring varieties is described which were made with these aims in view.

A number of crosses have been made among varieties of oats to improve straw stiffness, yield, grain quality and to breed rust resistant forms. The production of forms with naked grains is also desired, and as in barley, varieties which will not germinate in the ear. For the latter character, *Avena byzantina* is used for crossing.

In breeding peas, the objectives are few but important ; earliness, green peas of good cooking quality and pods which do not split. For yield, Mahndorfer Viktoria pea serves as standard ; up to now it has not been possible to increase its yield and to preserve at the same time its quality. Resistance to *Grapholitha* may be obtained by growing earlier varieties with a short flowering period. Crosses of Mahndorfer Viktoria with Saxa gave a transgressive segregation towards earliness. At present however, the progeny is too weak in growth and susceptible to frost. Lines with a good cooking quality have been selected from the cross Mahndorfer Viktoria and Korbfüller. The so-called sugar peas have no palisade cells on the inside of the pod and therefore lack the mechanism for splitting.

To produce a pea with a satisfactory pod, crosses have been made with Mahndorfer Viktoria and a number of other German varieties such as Heinrichs Frühe, Bismark, etc.

No breeding work is being done with sugar beets or potatoes but yield and methods of testing yield are being investigated.

636. Lokscha, H. 633:575(49.2)
Pflanzenbauliches aus Holland. (**On plant culture in Holland.**)
Zprávy výzkumných ústavů zemědělských RČS. Praha 1932 : No. **53** : pp. 65.

During a study tour in Holland the Plant Breeding Institute at Wageningen was visited where the following problems are being investigated : heterosis in rye, turnips and rape, yield studies, tillering and germinating in the stook in cereals, pure lines and mixtures of lines, degeneration in rye progenies and pollen distribution in rye.

Genetic analyses of cultivated crops and incidental problems such as sterility are being investigated. Potatoes, rye and wheat, flax, beans and peas form part of the experimental material. Cytological investigations on species hybrids and induced mutations, etc., are being pursued and the physiological problems of yield are also receiving attention.

In addition to its organizing and scientific activities the Institute also breeds various crops and has placed several valuable varieties on the market.

A field collection of types of cereals obtained by hybridization with Asiatic and other foreign forms was also inspected.

The Institute also co-operates with various organizations and private individuals and seed certification concerns with a view to the promotion of plant breeding and the distribution of good varieties. The far-reaching influence and activities of the seed control organizations in Holland are fully described.

The Friesian Agricultural Society's achievements in the improvement of potato culture by seed certification and a study of the problem of degeneration are discussed, and successful new forms obtained by breeding or selection are mentioned.

Much information on the cultivation and yields of various cereal crops throughout the country is also included in the report.

637. Ghimpu, V. 633:576.312.32
Cromozomii câtorva plante cultivate. (**The chromosomes of some cultivated plants.**)
Viaţa Agric. 1933 : **24** : 412–17.

Very brief descriptions of the chromosomes of poppy, soya bean, peanut, tobacco, *Ricinus* and Sudan grass, taken from the existing literature.

638. Lokscha, H. 633–1.521.5(43.7)
Über die Saatgutanerkennung in der Tschechoslowakei. (**On seed certification in Czecho Slovakia.**)
Züchter 1933 : **5** : 14–18.
An outline of the development, present state of seed certification and its organization and achievements during the past 25 years in Czecho-Slovakia.

639. Lacoudre, M. 633:608.3(44)
Note au sujet de la création au sein de l'Association Française des Sélectionneurs de Plantes de Grande Culture, d'un syndicat professionnel de défense des obtenteurs de nouveautés végétales agricoles. (**Note on the formation within the French Association of a technical organization for the defence of producers of new agricultural plants.**)
Sélectionneur 1933 : **2** : Fasc. spéc. 55–57.
The aims and internal economy and initial activities of this body recently formed for the protection of originators of new plant forms are mentioned.

633:608.3(44)
Syndicat professionnel de défense des obtenteurs de nouveautés végétales agricoles. (**A technical organization for the defence of producers of new agricultural plants.**)
Sélectionneur 1933 : **2** : Fasc. 3 : 5-9.
In continuation of the previous explanatory notice on the origin of this new body for the protection of breeders of new plant forms, the text of its statutes is now presented.

640. Jørgensen, A. V. 633:608.3:58(48.9)
Beskyttelse for nye plantesorter. (**Protection for new varieties of plants.**)
T. Frøavl 1934 : 22 : 389-95.
A discussion on plant patent regulations in various countries and with special reference to Denmark.

633-1.582:575.148
641. Boerger, A. 633-2-1.521.6:575.148
" Monoculture," or single crop farming, in Rio de la Plata.
Int. Rev. Agric. Rome 1933 : **24** : 497-510.
The varieties of crop plants called " local varieties " and forming populations adapted by natural selection to their respective environment are, as a result of systematic selection, being replaced nowadays by a number of " pure lines " grown over vast zones. The results of this marked tendency to monoculture of staple crop plants (or, single crop farming) is even further intensified when, as in Rio de la Plata, the widespread cultivation of pure lines is repeated on the same soil and leads to both soil fatigue and loss of vegetative vigour of the crop.
Though such immense uniform crops of homogeneous varieties may represent a gain for agriculture, they also include greater possibilities of loss due to specific enemies of a given susceptible pure line, as was demonstrated by the enormous damage caused by *Puccinia glumarum* in the wheat areas of Rio de la Plata where the fungus had been previously unknown.
The phenomena of soil fatigue, representing the after-effects of the repeated cultivation, are regarded as a definite form of " specialization " of the various crops, and the factors which determine such phenomena should, if possible, be identified for each crop. Experiments with flax as an oil crop in Rio de la Plata have revealed the specific resistance of certain indigenous varieties of flax, such as Malabrigo, Reconquista, and San Martin to repeated cultivation, and selection for still more resistant types is now in progress.
The desirability of crop rotations as opposed to monoculture was demonstrated by prolonged observations on wheat, oats and maize.

642. WALZ, 633.1:581.49
Ein Beitrag zur Kenntnis der Ligula der Gramineen. (**A contribution to the study of the ligule in the *Gramineae*.**)
Landw. Jb. Bayern 1933 : **23** : 315-61.
A comprehensive study of this pleomorphic character with a method of evaluating its importance as a morphological character in different plant forms. Illustrations and a bibliography of 119 references complete the paper.

WHEAT 633.11

633.11(42)

643. HUDSON, P. S. 633.11-1.547
English wheat varieties. (Conclusion.)
Z. Züchtung 1934 : A. **19** : 57-108.
The description of varieties (see " Plant Breeding Abstracts," Vol. IV, Abst. 377) is concluded and in Part II, beginning with a survey of the relevant literature, a detailed account is given of the developmental history of the living plant and its various organs.
The variety used in the experiments was Yeoman II which was examined periodically throughout the growing season and records made of the germination of the seedlings, leaf and later tiller development, the development of the ears in the individual tillers, and the interrelation of this with the tillers of different orders on the same plant ; the production of spikelets of each ear ; and finally the subsequent history of these florets.
A comparison is then made of plants grown under favourable and unfavourable conditions from which deductions are made as to some of the factors influencing yield and finally such deductions are tested by comparing the development of Yeoman II with Squarehead's Master.
The high tillering capacity of Yeoman II while advantageous on a good soil, led to a reduced yield under unfavourable conditions where the low tillering capacity of Squarehead's Master shewed to advantage in the production of a few but well developed ears.

644. ALABOUVETTE, L. 633.11(44)
Catalogue des variétés de blé—Registre des plantes selectionnées et commerce des semences. (**Catalogue of the varieties of wheat—Register of pedigree plants and trade in seed.**)
Sélectionneur 1933 : **2** : Fasc. 3 : 16-31.
An annotated summary of essential points contained in the various regulations relating to the formation of a catalogue of species and varieties of cultivated plants, to the register of pedigree plants cultivated on a large scale and to the regulation of trade in wheat seed.
A classified list of the species and varieties of wheat cultivated in France and their synonyms is appended.

645. 633.11(45)
COUDERC, F. and LONG, J. 633.11:575.127.2:633.14
Un voyage d'étude en Italie. (**A study tour in Italy.**)
Bull. Trim. Off. Reg. Agric. Midi 1933 : No. 47 : 221-67.
During a study tour in Italy the wheat breeding plots at the National Institute of Genetics for the Cultivation of Cereals in Rome were visited and in addition to various types of wheat, a wheat x rye hybrid Terninillo derived from a (Riéti x rye) x Riéti 1907 cross was observed. It is white eared, bearded, with oval grains weighing about 55 gr. per 1,000 grains and 80 kilos to the hectolitre. It is resistant to rust and matures late, and has in one test resisted –13° C. of cold, yielding at the same time 4,000 kilos per hectare of grain of good baking quality.
At the Bonafous Institute near Turin, wheat trials of 58 varieties were briefly inspected. Owing to its tendency to lodging the results with the wheat x rye hybrid Terninillo were not good in that region.
At the School of Pomology and Horticulture de Florence, the effects of self-fertilization in fruit trees is being studied, but no results are given in the present report.

646. Vasconcelos, J. de Carvalho e 633.11(46.9)
Trigos Portugueses ou de há muito cultivados no país. (**Portuguese wheats or those that have been cultivated for a long time in the country.**)
Bol. Agric. Lisboa 1933 : 1 : Pp. 151.
Descriptions of Portuguese native wheats and those cultivated in Portugal for a long time. A scheme of dichotomic keys has been drawn up for identifying all botanical varieties of wheat in the Portuguese agricultural flora.

647. Clark, J. A. and Quisenberry, K. S. 633.11(73)
Distribution of the varieties and classes of wheat in the United States in 1929.
Circ. U.S. Dept. Agric. 1933 : No. 283 : Pp. 76.
Statistical tables of the varietal distribution of the various classes of wheat and their varieties are shewn in detail. That the number of varieties grown should be reduced by the standardization of communities on the basis of the best adapted variety for the region is recommended in order that the new varieties which are being bred may replace the old ones as rapidly and completely as possible.

648. Kiesselbach, T. A., Anderson, A. and Suneson, C. A. 633.11(78.2)
Winter wheat varieties in Nebraska.
Bull. Neb. Agric. Expt. Sta. 1933 : No. 283 : Pp. 24.
Information is given on wheat improvement at the Nebraska Station, variety trials, tests of pure strains versus strain mixtures, varietal resistance to Hessian fly and winter smut, winter-hardiness, milling and baking tests. The more important varieties are described.

649. Clark, J. A. 633.11 *durum*
Varieties of *durum* wheat.
Fmrs.' Bull. Wash. 1933 : No. 1706 : Pp. 13.
The different varieties, where they are grown and their uses are described.

650. Ducomet, V. 633.11:575(44)
Les blés d'Aquitaine et leur rôle dans la constitution des blés actuels. (**The wheats of Acquitaine and their role in wheat production to-day.**)
Sélectionneur 1933 : 2 : 19–41.
The history of the wheats grown in Acquitaine including the Noé, Gironde and Bordeaux varieties is described. Full details are also given of the crosses made by Vilmorin and other breeders and of the various combinations in which Acquitaine wheats have been used. The fate of these wheats in other countries is considered at some length ; and their alternative names are given. The position of the Acquitaine wheats before and after the war and their possibilities in future breeding work are outlined, with brief suggestions for suitable crosses for obtaining quality, earliness and rust resistance as well as good yield.

651. Lamb, C. A. 633.11:575(77.1)
The status of wheat breeding in Ohio.
Bi–m. Bull. Ohio Agric. Expt. Sta. 1933 : 18 : 101–04.
Wheat breeding in Ohio is largely confined to the soft, red winter wheats.
The aim in wheat improvement is the production of winter-hardy, disease resistant, high yielding forms of good quality. The usual methods of hybridization followed by selection at various stages, yield trials under nursery and field conditions, and finally milling and baking tests are employed. The winter behaviour of varieties and the causes of winter injury are receiving special study.
For the investigation of disease resistance there is a nursery devoted entirely to the production of artificial epidemics of the most serious diseases prevalent in Ohio.
Another branch of research is devoted to the problem of " levels of fertility," new strains being grown on a wide range of available plant nutrients in order to ascertain their probable behaviour on poor, medium and good soils.

652. Voss, J. 633.11:575" 793 "
Die Unterscheidung von Sommer- und Winterweizen. (**Distinguishing spring and winter wheats.**)
Züchter 1934 : **6** : 19–24.

In view of the impossibility of distinguishing spring and winter wheats by their morphological characters alone, a method (first devised by Russian and Dutch investigators) has been elaborated, whereby the majority of German wheats may be successfully distinguished on the basis of physiological characteristics. A total of 180 German varieties of wheat were tested. The technique which is fully described consists essentially in forcing and rearing the plants in a special soil mixture in the greenhouse with the addition of periods of artificial lighting at a temperature of about 20° C.

In general late spring sowing resulted in the same behaviour in winter wheats as that observed in plants artificially reared in the greenhouse with additional illumination.

653. Miczyński, K. 633.11 *Aegilops* :575.11
Studja genetyczne nad rodzajem *Aegilops*. III. Dalsze doświadczenia z *Aegilops speltoides* Jaub. et Spach. (**Genetic studies in the genus *Aegilops*. III. Further investigations on *Aegilops speltoides* Jaub. et Spach.**)
Acta Soc. Bot. Polon. 1933 : **10** : 311–25.

The F_2 generation obtained from the cross *Aegilops speltoides* var. *ligustica* x var. *Aucheri* indicated that a single Mendelian factor difference distinguishes these two varieties. A similar genetic basis was responsible for the characters rough and smooth glumes exhibited in varieties of *Ae. speltoides* and rough type was dominant over smooth.

The degree of awnedness and absence of awns were studied in the cross var. *polyathera* Boiss. x var. *Aucheri* Fiori.

Though the genetic constitution of var. *polyathera* for awn type could not be definitely elucidated, the results in one year appeared to indicate the existence of one main factor controlling the difference between the " awnless " (including the weakly awned) type and the strongly awned type, heterozygotes being weakly awned and approaching more closely to the awnless var. *Aucheri* ; the results of the following year, however, suggested a polymeric basis for awnedness. The action of the awn factors is strongly influenced by environmental conditions and thus awnedness in the same family or pure line may alter from year to year. Nevertheless, the homozygous awnless segregates apparently remain unchanged.

654. 633.11:575.11.061.6
Shen, T. H. 633.11:575.11–181
(**Inheritance of quantitative and qualitative characters in wheat crosses.**)
Nanking J. 1933 : **3** : 129–42.

The material used in these crosses was Forward which produces tall plants (137.68 cm.) with red grain and medium lax and long ear and Albit which has white grain, club ear and is later and shorter (125·28 cm.) than Forward. Grain colour shewed an intermediate condition in F_1 and from the segregation in 14 F_3 families the inheritance of red colour of grain is interpreted as being due to two independent genes *AABB* and white grain colour as due to *aabb*.

As regards the length of ear the F_1 shewed a condition in which the Albit ear type was partially dominant over the Forward type. F_2 and F_3 results indicated a single factor difference for compactness of the ear, the club head of Albit being due to the gene pair *LL* while *ll* represents the Forward head type.

Some of the data suggested the possibility of the existence of linkage between the gene *L* for ear type and either *A* or *B* for the grain colour and also a very close linkage between the type and the length of the ear. Evidence also suggested a high linkage correlation between ear type and stem length as well as plant height, though a large population would be needed to confirm this relationship. Two possible hypothesis are tentatively discussed and on the whole the author inclines to favour the assumption that the gene *L* for ear type affects both rachis length and stem length.

No linkage was found between awnedness, grain colour, plant height and date of heading in crosses between Japan Bearded, Honor and Early Arcadian.

655. Dusseau, A. 633.11:575.127.2:576.354.4
Sur la sporogénèse de l'hybride *Triticum haplodurum* issu du croisement de deux *Triticum vulgare*. (**On the sporogenesis of the hybrid *Triticum haplodurum* obtained from the crossing of two *Triticum vulgare*.**)
C.R. Acad. Sci. Paris 1933 : **197** : 346–47.
A cytological investigation was made on the F_5 of a *haplodurum* plant previously described (see " Plant Breeding Abstracts," Vol. III, Absts. 54 and 620) and shewed, as in the F_1, 14 chromosomes in the somatic cells, 7 in the dividing pollen mother cells.

656. Plotnikowa, T. W. 633.11:575.127.5:633.14:576.3
Zytologische Untersuchungen an hyperchromosomigen Weizen-Roggen-Bastarden. (**Cytological investigations on hyperchromosome wheat x rye hybrids.**)
Z. indukt. Abstamm.– u. VererbLehre. 1934 : **66** : 404–24.
A number of wheat x rye hybrids that had originated by chance crosses were examined and in the hybrids of the interbred second generation from the open pollinated backcross to the *Triticum* parent the diploid chromosome number was found (with only one exception) to vary from 42 to 49, *i.e.*, 2n was generally higher than in the original parent plants.
Many of the hyperchromosome hybrids produced progeny which had also excess chromosomes, while other of the hybrids, gave as well as hyperchromosome plants, also forms with the same or approximately the same chromosome number as that of wheat.
Certain meiotic irregularities in the hyperchromosome forms are described. The percentage of normal pollen grains and the fertility of the second generation hybrids above referred to are often independent of these irregularities in meiosis.
The semi-heterotypic divisions and the unequal distribution of the chromosomes to the pollen are regarded by the author as the most likely cause of the hyperchromosome forms in wheat x rye hybrids. The views of other workers are also given with reference to this point. The writer concludes that it is very probable that in the F_1 generation egg cells with the somatic chromosome number are formed which on being fertilized by wheat pollen give 49 chromosome plants which may in turn produce a very varied progeny.
Many of the hyperchromosome hybrids are completely fertile and self-fertile. The question of fertility is to be discussed in a subsequent paper.

657. Tschermak–Seysenegg, E. 633.11:575.129:576.356.5
Weitere Studien am fertilen, konstanten Artbastard *Tr. turgidovillosum* und seinen Verwandten. I. Teil. (**Further studies on the fertile constant species hybrid *T. turgidovillosum* and related forms. Part I.**)
Z. indukt. Abstamm.– u. VererbLehre. 1933 : **66** : 180–218.
Quantitative and qualitative proof for the author's theory of chromosome addition has already been found but further confirmation may be gained by the behaviour of the constant di-diploid hybrid on backcrossing with one of the two original species, either the form already used in the cross or others.
In the F_1 the somatic cells are di-haploid and the plant has the poor growth associated with haploidy. By non-reduction of the gametes a vigorous constant fertile di-diploid F_2 is formed and the possible behaviour of the chromosomes of such gametes under various conditions is discussed.
Efforts to produce in 1931 other fertile F_2 hybrids between *T. villosum* and other *Triticum* species were unsuccessful ; in one cross between *T. turgidum* (not the variety originally used) and *T. villosum* in which from the one grain set in F_1, an F_2 plant was grown which resembled the F_1 but was completely sterile. A further description of the original constant hybrid is given.
As *T. villosum* is completely immune to brown rust and the constant hybrid partially so, crosses were made between *T. turgidovillosum* and cultivated wheat varieties in the hope of combining their resistance with other valuable characters but without success. A cross between *T. turgidovillosum* and an awnless Squarehead segregated in F_2 into speltoid, *vulgare*, *durum* and *turgidum* forms.

The results of crosses with other *Triticum* forms were a fragile F_1 with a much weaker though still recognizable " *villosum* pubescence " and very poor fertility which, however, improved in the later generations. With *T. durum* the results were very similar, though possibly the fertility was slightly greater. A cross between *T. turgidovillosum* and the almost sterile F_1 of the recently made cross *T. turgidum* x *T. villosum* gave an almost completely fertile F_1.
The constant species hybrid, as well as the F_1 obtained in 1931, could be fairly easily crossed with both rye and wheat-rye hybrids which by repeated backcrossing to rye had become more or less fertile. The hybrids were, like the wheat-rye hybrids, completely sterile, but by backcrossing with the fertile wheat-rye hybrids, plants were obtained which shewed characters of all the parents.
Crosses are described between *T. villosum* and *Aegilops ventricosa*, *ovata* and *triaristata* of which all the hybrids were sterile, and between *T. turgidovillosum* and fertile forms of *Aegilotricum* which should produce fertile progeny from F_3 onwards. These shewed a marked dominance of *Aegilops* characters, the " *villosum* pubescence " was completely lacking.

658. Huskins, C. L. and Spier, J. D. 633.11:576.356:576.354.46
Heteromorphic homologous chromosomes of wheat considered in relation to the chiasmatype and classical hypotheses.
Amer. Nat. 1934 : **68** : 80–81. (Abst.)
From a comparative study of three heteromorphic pairs of homologous chromosomes, differing in degree of inequality distal to the spindle attachment, evidence is derived in favour of the general partial chiasmatype hypothesis and the chiasma theory of metaphase pairing.

659. Katayama, Y. 633.11 *Triticum monococcum* :576.356.2:537.531
Haploid formation by X-rays in *Triticum monococcum*.
Cytologia. 1934 : **5** : 235–37.
The frequency of occurrence of haploid plants in *Triticum monococcum* under normal field conditions was observed to be 0·48 per cent. in 1,243 individuals. X-ray treatment of young ears at the period of meiosis increased the rate of occurrence of haploids to some extent. A considerable increase in the number of haploids (*i.e.*, 17 per cent.) resulted from the application of X-rayed pollen to the normal pistils of emasculated plants. Irradiation of the pistils, however, in 21 cases gave no haploid individuals, from which it is deduced that the female germ cells cannot be activated by exposure to X-rays to produce embyros. The explanation offered in the case of irradiated pollen is that the latter, if they entered the ovule, degenerated without fusion with the egg nuclei while the female nuclei may have been activated to parthenogenetic development by the stimulus of the male nuclei. The endosperms may have developed by a similar process in the egg. No division of the polar nuclei could be observed in the emasculated flowers.

660. Friedberg, L. 633.11:581.48.04
Essai de classification des blés d'après leur réaction à l'acide phenique.
(**Attempted classification of wheat by their reaction to phenol.**)
Ann. Agron. Paris 1933 : **3** : 697–736.
A very comprehensive report on the classification and identification of wheats by their reaction to phenol.

661. 633.11:581.5(82)
Rudorf, W. 633.11:664.641.016:575
Die ökologischen Bedingungen des argentinischen Weizenbaus mit besonderer Berücksichtigung der Sortenfrage und der Schaffung einheitlicher Exporttypen.
(**The ecological conditions of wheat cultivation in the Argentine with special regard to the question of varieties and the creation of uniform types for export.**)
Kühn–Archiv 1933 : **38** : 46–83.
The climate and topography of the agricultural district of the Argentine are described. This is divided into five zones each with uniform ecological features. The results of variety tests

shew that three varieties, Sin Rival, Vencedon and XIIIt, give a reliable and high yield in all five zones which means, that though the area concerned covers 10 degrees of latitude and 8 of longtitude, it is a simple matter to maintain a high standard of uniformity of production.
The question of breeding for quality and the improvement in this respect of existing varieties is discussed. Although the flour of many Argentine wheats is unsuitable for baking alone, it is invaluable as an addition to wheat flours. A classification is given of Argentine wheats according to their baking quality which should prove of use to the plant breeder.

662. 633.11-1.547.2:632.183
633.16-2.183:575
633.16-1.547.2:632.183

CLARK, E. R. and WILSON, H. K.
Lodging in small grains.
J. Amer. Soc. Agron. 1933 : **25** : 561-72.

Rates of tillering were studied in 24 varieties of spring *durum* wheat and in 17 varieties of barley. No differences which could be regarded as genetic were found in the tillering rates of the wheats, nor was any correlation discernible between the tillering rates of wheat varieties and their lodging behaviour at another Station the previous year.
The barleys exhibited significant differences in tillering rate ; it is believed that these differences may be genetic.
No correlation was found between breaking strength and lodging in any of the series of wheat trials compared.

663. CONSTANTINESCU, E. 633.11–2.111
Winterfestigkeitsbestimmungen an rumänischen Winterweizen. (**Determination of winterhardiness in Rumanian wheats.**)
Pflanzenbau 1933 : **10** : 224–28.

The winterhardiness of 11 Rumanian varieties of winter wheat was tested by artificial frost, refractrometic determinations of dry matter content, field observations, sugar estimations, and the determination of osmotic pressure. The value of these various methods is discussed.

664. 633.11–2.111–1.521.6
633.14–2.111–1.521.6
633.13–2.111–1.521.6

SALMON, S. C.
Resistance of varieties of winter wheat and rye to low temperature in relation to winterhardiness and adaptation.
Tech. Bull. Kans. Agric. Expt. Sta. 1933 : No. 35 : Pp. 66.

The aims of the freezing trials here reported were (1) to investigate the capacity of many varieties and strains to survive low temperatures, and (2) to estimate the value of artificial refrigeration for studying winter killing.
The experimental material consisted mainly of wheat but also a few varieties of rye and one of barley and one of oats. Incidentally it is pointed out that if resistance to low temperature should prove to be highly correlated with winterhardiness in the field, it should be possible to determine the relative winterhardiness of new varieties and strains within a few weeks.
The technique and its various incidental problems are described in detail.
It is claimed that the data obtained from the winterhardiness nurseries which were conducted by the U.S. Department of Agriculture, Division of Cereal Crops and Diseases in co-operation with the agricultural experiment stations of various states, afford the most extensive and reliable information available regarding the relative winterhardiness of a considerable number of varieties of winter wheat. The results are fully discussed and evaluated.
Evidence was obtained indicating that the method of controlled freezing could be successfully used to eliminate non-hardy segregates in hybrid populations from a number of crosses and also non-hardy varieties in mixtures.
The rate of loss of hardiness in wheat and the problem of cold resistance as a possible factor in the adaptation and distribution of crop plants are also considered.
The relevant literature on artificial low temperature effects in plants is summarized and the bibliography of 92 references should prove useful.

665. MAINS, E. B. 633.11–2.42–1.521.6:575
Inheritance of resistance to powdery mildew, *Erysiphe graminis tritici* in wheat.
Phytopathology 1934 : **24** : p. 14. (Abst.)
Crosses of Norka C.I. 4377 with the varieties Webster, Ceres, Chinese, Kota, Malakoff, Reliance and Warden which are susceptible to physiological form 1 of *Erysiphe graminis tritici*, shewed the resistance of Norka to be a simple dominant and also to be inherited independently of the resistance of Norka to form 3 of *Puccinia rubigo-vera tritici*. The resistance of Red Fern to mildew also behaves as a simple dominant ; while the resistance of Hope C.I. 8178 in crosses with the susceptible varieties Chinese, Marquis, Michigan, Amber and Reliance, behaved as a simple recessive, as did also the resistance of Sonora and of Michigan Amber 29–1–1–1 in crosses with Chinese.

666. NIEVES, R. 633.11–2.451.3
La caries o carbón hediondo del trigo. (**Bunt or stinking smut of wheat in Argentina.**)
Bol. Mens. Min. Agric. Nación Argentina 1933 : **32** : 397–411.
Breeding for bunt resistance is in progress but seed disinfection the author regards as likely to be more effective owing to possibility of new physiological forms of *Tilletia* being introduced or arising by mutation.

667. ROEMER, T. and BARTHOLLY, R. 633.11–2.451.3–1.521.6:575
Die Agressivität verschiedener " Steinbrandherkünfte " [*Tilletia tritici* (Bjerk.) Wint.] und ihre Veränderung durch die Wirtssorte. (**The virulence of collections of bunt [*Tilletia tritici* (Bjerk.) Wint.] of different origins and the changes produced by the host variety.**)
Phytopath. Z. 1933 : **6** : 469–506.
In 1932 the wheat harvest of Germany suffered an attack of bunt more severe than had been known for 15 years in spite of the disinfection of the grain. It has therefore become important to breed resistant varieties.
The first step in this direction was an accurate knowledge of the parasite and it was soon clear that external conditions had a great effect on the degree of infection and therefore infection in the field is not a satisfactory means of testing resistance.
A method is described for the cultivation of the plants in pots to ensure the maximum infection and then their transplantation to the field.
Six collections of bunt of different origins were used for the tests of virulence on (I) the varieties of winter wheat Heils Dickkopf and Hohenheimer 77 which had already proved resistant (II) the American varieties Ridit, Martin, Red Hussar and White Odessa which, except Ridit which was resistant to all, were resistant to the American collection but moderately susceptible to that of Halle, and (III) the very susceptible variety Panzer III. Six varieties of spring wheat were also tested. The results shewed clearly the existence of physiological races of bunt and also that among spring and winter wheats there were varieties and strains with different degrees of resistance and that valuable forms resistant to bunt may be produced by crossing.
The effect of the host plant on the virulence of the different collections was tested and it was found that a clear but specific change in virulence occurred.
At Halle the progeny of crosses for bunt resistance were infected annually and the susceptible plants destroyed. This method shewed in 1932 that the crosses, such as those with Ridit, which had produced the greater number of resistant plants were also the most resistant to the attack of that year. The importance of using the most virulent collection of bunt is also shewn.

668. BRIGGS, F. N. 633.11-2.451.3-1.521.6:575.11
Inheritance of resistance to bunt, *Tilletia tritici*, in Sherman and Oro wheat hybrids.
Genetics 1934 : **19** : 73-82.
The resistant varieties Sherman and Oro were each crossed with Baart wheat. A monohybrid ratio for resistance to bunt was obtained in each case, but there were indications that modifying factors might be present in the Oro x Baart cross.

Sherman was crossed with Martin and Turkey and the data shewed that the factor of bunt resistance in Sherman wheat is identical with the Martin factor.
The cross Turkey x Oro shewed that in Oro the resistance factor is identical with the Turkey factor.
A discussion of the data on bunt resistance obtained by other workers indicates the need for further genetical analyses and more data on the physiological forms of bunt.

669. Piescu, A. 633.11-2.452-1.521.6
Selecţiunea plantelor şi rugina cerealelor. (**Plant selection and cereal rusts.**)
Viaţa Agric. 1933 : **24** : 72-79.
A short account of the cereal rusts taken from existing literature. It is pointed out that the only way to combat the disease is to obtain resistant varieties and a brief description is given of the methods of testing varieties with different physiological forms.
Such work is being undertaken by the " Institutului de cercetăre agronomice " at Cluj in the hope of producing high yielding, resistant strains of good quality wheat.

670. Becker, H. 633.11-2.452-1.521.6:575
Zur Immunitätszüchtung des Weizens gegen *Puccinia glumarum* und *Puccinia triticina*. (**On breeding wheat for immunity to *Puccinia glumarum* and *P. triticina*.**)
Kühn-Archiv 1933 : **38** : 293-305.
The work on problems connected with breeding wheats immune to yellow and brown rust at Halle are described.
The effect of external conditions such as light and temperature on the infection by yellow rust has been investigated by Rudorf who has also established the fact that resistance was not related to chromosome number.
Eleven different lines of yellow rust have been identified at Halle, six of which are identical with lines already determined by Gassner, and systematic breeding for resistance is being carried out. Crosses with the resistant wheat, Chinese 166, have shewn that its resistance is dominant and probably due to two factors. In a number of spring wheats, however, resistance behaves as a recessive factor. In the latter case selection can be begun in the F_2, but in the former it is better to wait till later generations.
The methods used in infecting and selecting the resistant plants are described. Vernalization is used with success to speed up the development of the plants after thay are planted out.
The reaction of plants to infection in the greenhouse is also compared with their reaction to attack in the field and the behaviour towards individual lines is being investigated. Radulescu has found that temperature has a very great effect on the develpoment of the fungus in the plant though it is still an open question whether it is due to a direct effect on the fungus or to a change in the physiological condition of the host plant.
Breeding for resistance to *Puccinia triticina* was only begun in 1931. Work has been done on the identification of biological races, and of the *vulgare* wheats tested only Ardito, Varonne and Aurore were resistant to all the lines used and have been employed for breeding. Madonna, among the *durum* wheats, was also resistant.
Resistance to line 15 of brown rust and to yellow rust has been combined in the progeny of Normandie x Blausamtiger-Kolben but as resistance to brown rust is determined by a dominant factor, it is not yet certain whether complete homozygosity has been obtained but it is hoped eventually to produce a wheat, which, besides being resistant to both brown and yellow rust, will possess other qualities of economic value.

671. Nicolas, G. 633.11:664.641.016
L'amélioration du blé dans la Haute-Garonne. (**The improvement of wheat in the Upper Garonne region.**)
Sélectionneur 1933 : **2** : Fasc. spéc. : 42-50.
The work that is being done to produce a variety adapted to the Garonne district and resistant to lodging, rust and heat injury is described.

In 1932-33, 130 lines were retained as promising material. A large number of these strains are described and particulars of yield and disease resistance, etc., are tabulated. Similar details are briefly given of certain varieties bred by other workers.
Since the problem of yield is being solved for the region in question, grain quality and baking quality of the flour are now being studied.

672. NICOLAS, G. 633.11:664.641.016
La valeur boulangère des blés du Sud-Ouest. (**The baking quality of wheats of the South-West region.**)
Sélectionneur 1933 ; **2** : Fasc. spéc. : 51-54.

The baking quality of wheats from Departments of the South-West region of France has been investigated by the extensimeter and other tests ; the results are shewn in tabular form. Many of the varieties appear worthy of selection for breeding purposes.
If funds permit, it is hoped to continue these tests for several years in order that the average baking quality may be established for each variety.

673. EDEL, P. 633.11:664.641.016
Die Bestimmung der Kleberqualität bei Weizen mit der Schrotgärmethode. (**The determination of gluten quality in wheat by the whole meal fermentation method.**)
Mühle 1934 : No. 5 : pp. 4.

A statement of the principles of Pelshenke's (see " Plant Breeding Abstracts," Vol. I, Abst. 340) method of gluten determination is followed by a résumé of the results obtained with it by workers in other countries. In general the opinions of these investigators have been favourable, and with 2,000 wheat samples the author found that in 80 per cent of cases Pelshenke's test was sufficiently reliable. Hints are given as to how the technique should be carried out in order to secure satisfactory results. The simplicity, the low cost and above all the rapidity of this method of gluten determination are emphasized.

674. PELSHENKE, P. 633.11:664.641.016(43)
Weizen- und Weizenmehlqualität in Deutschland. (**The quality of wheat and wheat flour in Germany.**)
Kühn-Archiv 1933 : **38** : 84-95.

In 1932 and 1933, the first time for many decades, Germany produced enough wheat for her own requirements. This was due to the increase in the area of wheat cultivation at the expense of rye and oats, the decreased use of wheat for human consumption, the improvement in cultivation and the higher prices of wheat.
An examination of the gluten quality of the land wheats grown shews that these have with few exceptions a high gluten content of good quality. That high yield can be obtained with good quality is now an accepted fact and improvement in this direction is one of the aims of plant breeding in Germany.
The gluten content of the wheats for the three years 1931-33 was determined and the results arranged in three groups, according to districts 1, high for the three years, 2, high in one or two years and 3, low in all three years. It was clear that climate alone was not responsible for the variations in gluten content but that variety, soil and manuring also had a considerable influence. With regard to gluten quality, the variety is the determining factor. A number of German wheats were examined and a list is given of those of A and B quality. Of these 30 wheats only 4 spring wheats are of A quality. The quality of the flour of German wheats and their distribution throughout Germany are discussed.

675. SCHNELLE, F. and HEISER, F. 633.11:664.641.016:575
Die Qualität des Hallischen Weizensortimentes sowie die Voraussetzungen und Ziele der Qualitätszüchtung. (**The quality of the wheat collection at Halle and the requisite conditions and aims of breeding for quality.**)
Kühn-Archiv 1933 : **38** : 23-45.

The gluten quality (determined by Pelshenke's method), 1,000 grain weight and time of heading and flowering were investigated in 212 winter wheat and 117 spring wheat varieties for three successive years 1930-32.

The variation in gluten quality in an individual variety during the three years is attributed to the climatic conditions. Temperature and especially the maximum temperature has a more marked influence on the laying down of the starch and the size of the grain than the amount of rain or sunshine.
The average gluten quality of most of the spring wheats was lower than that of the winter varieties, so was also the 1,000 grain weight, except in the spring wheats of *turgidum* species which had consistently larger grains.
The varieties were divided into three groups for baking quality, A, good, with a value above 150, B, medium, with a value above 85 and C, poor. One variety of *T. monococcum* and one of *T. dicoccum* was included in group B, all the rest fell into C. Most varieties of *T. spelta* belonged to group B, only some Bulgarian wheats to C.
A winter *durum* from Southern Bulgaria attained grade A, all other *durums* were classed as B. Most of *T. turgidum* and all *T. polonicum* belonged to C, and the two " wonder " wheats, *T. compositum*. Some of *T. compactum* were included in C, the rest in B.
Of the varieties *T. vulgare*, 14 winter and 10 spring wheats belonged to A. They came from such different countries as South Russia, Hungary, Greece, Bulgaria, Spain, Portugal, North and South America and Germany. A number were high up in group B and some in C which included most of the German wheats.
T. vulgare is the only species of wheat of which a large number of both winter and spring wheats have a gluten quality high enough to belong to group A. A large percentage have a value above 120 per cent ; that is, higher than the best varieties of all other wheat species.
These investigations shew that there are now a number of winter wheats of the best quality and the data provide a useful source of information for the plant breeder wishing to improve the quality of winter wheats.
The 1,000 grain weight did not shew much variation during the three years of the experiment. *T. monococcum* had the smallest grain and *T. turgidum* the largest. Varieties of *T. durum* (spring and winter wheats) were the earliest to head and flower, followed by *T. spelta* and *T. vulgare* and with a few days interval, *T. compactum* and *turgidum*, the latest were *compositum*, *dicoccum* and *monococcum*.
A direct relation was found between time of heading and flowering and the quality of the gluten. The quicker the growth the better the quality. An estimation of the quality of wheats whose origin was known, shewed that the A quality wheats came from East and South Europe, those of lesser quality from West Europe.
The gluten quality, regarded as a varietal characteristic, is not obscured by climatic conditions. The aims and position of breeding for quality in Germany is discussed.

676. Holdefleiss, P. 633.11:664.641.016:575(43)
Qualitätsproduktion, Qualitätszüchtung und Qualitätsforschung in der deutschen Landwirtschaft. (**Quality as an aim in production, breeding and research in German agriculture.**)
Kühn-Archiv 1933 : **38** : 1-22.

The present economic conditions demand a greater improvement in the quality of the products of German agriculture of which quantity was formerly the chief aim.
At Halle the question of quality has been investigated from a practical point of view and the present situation with regard to the quality of wheat is dealt with in all its aspects.

677. Winter, O. B. and Gustafson, A. G. 633.11:664.641.016:578.08
Some experiences with the wheat meal fermentation time tests for evaluating soft wheats.
Cereal Chem. 1934 : **11** : 49-56.

This short method for determining the gluten strength of wheat meal (see " Plant Breeding Abstracts," Vol. IV, Abst. 142) is stated to be of special interest to the plant breeder for determining the quality of his strains.
With American Banner, Red Rock, Bald Rock, Number 912203 and Berkeley Rock wheats, the wheat meal fermentation time test gave greater differences between samples of flour than

did the tests based on the protein content test of the flour, the volume of the baked loaf or the expansion of the volume of the dough by the Wilsie Robinson and Winter method.
The differences found did not, however, shew a high positive correlation with either protein content or loaf volume and an adequate interpretation of the results was therefore difficult.
Preliminary results with a modified form of the test using the expansion of the dough ball instead of the time fermentation as a criterion compared favourably with the results obtained by the original method and required less of the operator's time.

678. 633.11.0014(51)
633.11.0014(52)
SHEN, T. H. 633.11:575(51)
A comparison between 537 foreign wheat varieties and certain Chinese strains.
Nanking J. 1932 : **3** : 1-45.

Yield tests were carried out at Nanking and Nanhsuchow from 1926-32 with 537 foreign varieties of wheat and 4,529 of local selections from the vicinity of Nanking, Wuchang, Nanhsuchow and Yihsien. The best local strain, No. 2905, equalled Red Rock, the best foreign variety, in yield and is also better adapted to the rotation system on account of its early maturity.
In 1928, eight strains were selected from 2,264 heads from the farmers' fields near Nanhsuchow and proved consistently higher yielders than Red Rock and matured as early as the control variety in tests from 1930-32 inclusive. The strains 106-6 and 150-1 averaged 5·9 and 5·2 bushels more per acre than Red Rock.
In view of the yield obtained in a late experiment (6th March) with leading varieties of American and improved strains of Chinese wheat, the use of local early varieties of American spring wheat instead of American winter varieties is advocated when late planting is necessary. Though on the whole foreign varieties may not be so adaptable as local forms to Nanking and Nanhsuchow conditions they have proved valuable for hybridization, certain crosses between foreign and Japanese wheats having given much higher yields than the best foreign varieties and matured as early as the local wheat used as a control.
It is recommended that foreign wheat from all different sources should be tested even though bearing the same varietal name, since differences in yield were found in varieties with a similar designation but obtained from various places.

OATS 633.13

679. MILATZ, R. 633.13
Neue Hafersortenmerkmale. (**New characters of oat varieties.**)
Angew. Bot. 1933 : **15** : 481–518.

The following new characters were found of use for the determination and special investigation on German oats and a number of foreign varieties :
1. The difference in 1,000 grain weight of the 1st and 2nd grains.
2. Grain shape—some alterations are suggested in the existing classification.
3. Panicle shape—on account of the changes which the panicle undergoes during ripening, a description is given of its shape at flowering, and at the milk ripe and yellow ripe stages.
4. The number of leaves of the main culm and the relation of the number of leaves to the period of growth.
5. The length of the topmost culm leaf in comparison with the length of the rest of the culm leaves.
6. The direction of the twisting of the culm leaves.
7. The shape of the topmost culm node.
8. The effect of changing the climatic conditions by sowing seed at the end of August was investigated. Certain changes were observed, for example, forms in which there was a slight pubescence of the leaf margins shewed a marked pubescence of the lowest leaf sheath. Varietal differences were also observed in their reaction to cold.

680. NISHIYAMA, I. 633.13:575.127.2:576.356.5
The genetics and cytology of certain cereals V. On the occurrence of an unexpected diploid in the progeny of pentaploid *Avena* hybrids.
Cytologia 1933 : **5** : 146–48.

From the self-pollination of an F_2 derivative from the cross *A. fatua* ($6x = 42$) x *A. barbata* ($4x = 28$), a diploid plant with 7 bivalents in the P.M.C. was obtained which differed from the mother plant and from the parents used in the original cross but had a certain resemblance to diploid *Avena* species.
A cytological examination shewed seven closely paired bivalents and though there was segregation for some characters in the next generation the chromosome number remained constant. The plant could be easily crossed with other diploid species and in the case of the crosses with *A. strigosa* and *A. Wiestii* seven normal bivalents were always present. From this it is assumed that the genom retained in the new form is the *strigosa* genom, derived from *A. barbata*.
As neither the time nor the mechanism of the chromosome elimination are known the possible mode of origin is not discussed.

681. RU, SHOU-KENG 633.13:575.242
Inheritance of the fatuoid characters in *Avena*.
Abstract of a thesis presented to the Faculty of the Graduate School of Cornell University Ithaca, New York, 1933 : Pp. 4.

In crosses of White Fatuoid x Swedish Select, and Yellow Fatuoid x Swedish Select the fatuoid characters, horseshoe shaped articulation, dense basal hairs, heavily pubescent rachilla and strong, twisted and geniculate awns behaved as partially recessive in F_1, the primary grain of the F_1 plants having the fatuoid characters in reduced form, the secondary grain completely resembling *sativa*. In F_2 a ratio of approximately 1 *sativa* : 2 intermediate : 1 fatuoid was obtained, while in F_3 the intermediates segregated again as in F_2 and the other two types bred true.
The fatuoid complex of the White and the Yellow Fatuoid is identical and was inherited as a unit in both crosses. In the author's opinion there are some grounds for interpreting the 1 : 2 : 1 ratio for the segregation of fatuoid hybrids as due to chromosome aberration in preference to the action of monohybrid factors or a group of closely linked factors.
The F_1 from a Yellow Fatuoid x *Avena sterilis ludoviciana* No. 4 cross was of the black *sterilis* type and resembled the wild *sterilis* parent in all respects. In F_2 a 9 : 3 : 3 : 1 ratio of black *sterilis*, black fatuoid, yellow *sterilis* and yellow fatuoid types respectively was obtained and the F_3 results too suggested the presence of two independent factors or one factor and one group of closely linked factors for colour and the *sterilis*-fatuoid complexes.
The black grain colour of *A. sterilis ludoviciana* No. 4 shewed monohybrid segregation with the yellow of Yellow Fatuoid and was completely linked with the factor for dorsal pubescence of the grains ; the factor for yellow grain colour was invariably associated with lack of dorsal pubescence. From the F_2 ratios for the primary and the secondary grain in the Yellow Fatuoid x *A. sterilis ludoviciana* No. 4, two pairs of genes were assumed for pubescence. These were, the gene P for pubescence on the primary grain and the gene S for pubescence on the secondary grain, P being a basic gene for pubescence and S being unable to act in the absence of P, but P being capable of a slight action on the secondary grain even in the absence of S.
In the F_2 of the Yellow Fatuoid x *A. sterilis ludoviciana* No. 4 cross a single factor difference was found to control the length of grain.
The long grain was completely linked with the *sterilis* complex and the short grain with the fatuoid complex.

682. DARLINGTON, C. D. 633.13:576.354.46
The origin and behaviour of chiasmata IX. Diploid and tetraploid *Avena*.
Cytologia 1933 : **5** : 128–34.

The equilibrium positions of the chiasmata, characteristic of a number of cereals, were studied in the quadrivalents formed by an autotetraploid *Avena* and provide a means for the investigation of the forces at work on the chromosomes.

The diploid used for comparison was an F_6 plant from the cross *Avena barbata* x *A. strigosa* whose bivalents had a mean chiasma frequency of 2·57 (total) and 1·66 (terminal).
Of the ten possible types of complete terminalization of the quadrivalents, eight were found and incomplete instances of the other two.
The behaviour of the quadrivalents confirms the conclusion regarding chromosome movement before and during metaphase, reached in a study of simple configurations.

683. RADEMACHER, B. 633.13-2.19-1.531.12
Weitere Untersuchungen über die Ursachen der Flissigkeit beim Hafer und deren Abhängigkeit von der Herkunft des Saatgutes. (**Further investigations on the causes of "white ear" in oats and the dependence of these causes on the origin of the seed.**)
Arb. Biol. Reichsanstalt Land- u. Forstw. 1933 : **20** : 587–602.
The defect in question is regarded by the author as a deficiency symptom due mainly to lack of water before the panicle emerges from the sheath, but also to the lack of other nutrients and to various environmental factors, such as insufficient light, heat and soil aeration, etc. Moreover, the place of origin of the seed also affects the water metabolism of the subsequent plants and thus constitutes a contributory factor in producing the defect.
The progeny of plants subjected during the critical stage to a period of drought exhibited less tendency to the formation of "white ears" than the progeny of plants kept constantly under damp conditions.

RYE 633.14

684. MOOERS, C. A. 633.14 Balbo
Balbo rye.
Circ. Tenn. Agric. Expt. Sta. 1933 : No. 45 : Pp. 2.
Balbo rye, an Italian variety which is characterized by a rapid upright habit of growth, is of outstanding value for early pasturage and gave a slightly higher yield of grain than in the other varieties in the trials here recorded.

685. STAKMAN, E. C., MOORE, M. B. 633.14–2.451.3–1.521.6
and CASSELL, R. C. 632.451.3:576.3
The pathogenicity and cytology of *Urocystis occulta*.
Phytopathology 1934 : **24** : p. 18. (Abst.)
Tests for resistance of 139 selfed lines of rye shewed a range from highly resistant to completely susceptible. Inoculation of eight varieties of rye with five collections of smut gave no conclusive evidence of specialization. Opportunity for variation resulting from hybridization in *U. occulta* seems more restricted than in those smuts in which the sporidia become constricted off from the promycelium and bud freely.

686. LOKSCHA, H. 633.14:664.641.016
Bericht über die IV. Brotschau. (**Report on the Fourth Bread Show.**)
Verlautb. deuts. Sekt. mähr. Landeskulturrat. 1933 : **34/10** : 64–65.
In November 1933 the German and Czech section of the Moravian Agricultural Council held "the Fourth Bread Show of Products from the Associated Bakeries in Moravia." Only ryebread was sent in in loaf form (consisting mainly of rye flour with a milling grade of 65–70 per cent.). Each loaf was accompanied by a questionnaire which had been filled up, giving details of the management of the bakery, the proportion of dough and the baking process. The commission found a marked improvement as compared with the previous years. The following characters were included in the system of grading used in judging; amount by which loaf had risen, colour, surface, thickness of crust, and crumb (porosity, elasticity, colour, smell and taste). A.B.

687. MADER, W. and DOTZLER, F. 633.15:575:578.08
Eine Maiszuchtmethode in experimenteller Prüfung. **(A method of maize breeding experimentally tested.)**
Züchter 1934 : **6** : 12–18.
A method of maize breeding by continual individual plant selection on the basis of the performance of the first generation progenies, without separation of the sexes in the progenies, is analysed and declared to be of definite value as a breeding method.

688. BURNHAM, C. R. 633.15:575.116.12
Linkage relations of certain factors and their serial order in chromosome 5 in maize.
Amer. Nat. 1934 : **68** : p. 82. (Abst.)
The genetical and cytological data presented indicate that the order of the genes in going from the end of the long arm towards the shorter arm of chromosome 5 is v_2–ys_1–pr–bv–bm_1 with v_2 probably very close to the end of the longer arm.
The gene bt is very close to bm_1 (less than one per cent. recombination) but the order is unknown.

689. 633.15:576.312.36
HUMPHREY, L. M. 633.15:576.356.5
The behaviour of the extra chromosomes in Black Mexican inbreds and F_1 hybrids with Dent types of maize.
Amer. Nat. 1934 : **68** : 82–83. (Abst.)
Examination of 11, 8-year-old inbred lines of Black Mexican sweet corn in which no effort had been made to select for any particular chromosome number shewed extra chromosomes in every case and ranging from 2–10. Variability was noted within the lines. The extra chromosomes do not appear to be fragments, and in mitosis their behaviour is normal, indicating that spindle fibre attachments are actually present. In meiosis weakness in pairing is evident and various other anomalies occur with subsequent irregularities in the number of chromosomes distributed to the microspores. Behaviour in the F_1's is the same where extra chromosomes are present in pairs. Where only a single extra chromosome is present it behaves as a typical univalent.

690. BEADLE, G. W. 633.15:576.354.4
Polymitotic maize and the precocity hypothesis of chromosome conjugation.
Cytologia 1933 : **5** : 118–21.
Darlington's interpretation of his observations on the first extra division in polymitotic plants of maize was tested by a study of plants which were known to carry duplications for segments of chromosomes 2 and 5 and in trisomic polymitotic plants.
In neither case was there any definite association of homologous chromosomes or segments during the prophase of the extra division.
Certain configurations which suggested chiasmata were closely examined and were finally assumed to be due to overlapping.
There appeared to be a real association of chromosomes at a later stage which was not, however, the result of chiasmata.
No support was therefore found for the precocity hypothesis.

691. RHOADES, M. M. 633.15:576.356.2
A cytogenetical study of a reciprocal translocation in *Zea*.
Proc. Nat. Acad. Sci. Wash. 1933 : **19** : 1022–31.
A study of the linkage relations of a reciprocal translocation between chromosomes 2 and 5 found in untreated material has already been described (see "Plant Breeding Abstracts," Vol. 2, Abst. 432). The cytogenetical aspect is dealt with in the present paper.
Cytological observation at pachytene shewed that the point of translocation in No. 2 was in

the long arm but close to the insertion point and in No. 5 also close to the insertion point but in the short arm.

A ring of 4 was most constantly observed at diakinesis, only occasionally a chain of 4. At metaphase the arrangement was either an open ring, the adjacent chromosomes going to the same pole and giving non-viable combinations or a zig-zag, alternate chromosomes of which going to the same pole gave viable combinations of (a), two normal chromosomes and (b), two interchanged chromosomes.

Detailed genetical data are given for the backcross of plants heterozygous for lg_1–gl_2–b–v_4 and the point of translocation. By using the data from other backcross progenies as well, the following order is established: lg_1–gl_2–b–ts_1–tr–v_4 and from the cross-over data available the genes lg_1, gl_2, d_5, b, sk and ts_1 are more than probably in the short arm. There is evidence that suggests that there is about twice as much crossing-over in the distal half of the short arm as in the proximal half.

In No. 5 chromosome the order is shewn to be probably v_2–pr–bm_1–bt_1–tr. The production of viable gametes only when alternate chromosomes of the ring go to the same pole, gives rise to a pseudo-linkage which is loose in the case of pr and b and closer in the case of bt and b. The data suggests that the percentage of recombinations are lower in the megasporocytes than in the microsporocytes of plants bearing the translocation.

There are indications of a reduction in the amount of crossing-over which occurs in the arm in which translocation and interchange has taken place.

692. Burnham, C. R. 633.15:576.356.2:575.116.12

Chromosomal interchanges in maize: reduction of crossing-over and the association of non-homologous parts.

Amer. Nat. 1934: **68**: 81-82. (Abst.)

In plants heterozygous for a chromosomal interchange the greatest reduction in crossing-over was observed to be in the region nearest the point of breakage and the mid-prophase figures at meiosis in such plants shewed wide variation in the position of the "cross" with usually a close association of the parts. Since there was only one point of interchange in each chromosome, all the positions of the "cross" but one involve association of non-homologous parts and if crossing-over only occurs when homologous parts pair, then the observed reduction is explainable.

Another interchange is characterized by marked stability at mid-prophase and there is no reduction in crossing-over. When genes in both the interchanged and non-interchanged pieces in both chromosomes were simultaneously involved the observed recombination values could only be fitted into a cross-shaped linkage map, the point of intersection being the point of interchange.

693. Rhoades, M. M. 633.15:576.356.4

A secondary trisome in maize.

Proc. Nat. Acad. Sci. Wash. 1933: **19**: 1031–38.

A secondary trisome, found for the first time in maize among the progeny of a selfed plant which was trisomic for chromosome 6, is described and proved to be a secondary trisome of chromosome 5. The plant shewed an exaggeration of some of the features which are characteristic of the primary trisomes of chromosome 5. A study of the morphology of the extra chromosome in the secondary trisome shewed that the short arm of chromosome 5 is duplicated and the region of insertion is median.

Details are given of cytological studies of the secondary trisome at pachytene, diakinesis and first metaphase.

The distribution of chiasmata led to the expectation of finding figures of eight at diakinesis which, however, were never seen and the breaking and cancellation of chiasmata at diplotene is assumed by the author to be the most probable explanation for their rare or non-occurrence.

694. Randolf, L. F. 633.15:576.356.5

Tetraploid maize.

Amer. Nat. 1934: **68**: p. 66. (Abst.)

Tetraploidy (2n=40) may be induced in maize by intermittent heat treatments of the proembryo resulting not only in doubling of the chromosomes but also an increase in nuclear and

cell size and various other morphological and genetical differences as compared with the diploid form. The tetraploids produce abundant viable pollen which is distinctly larger than the pollen of diploids and on self-pollination or inter-crossing they are in general highly fertile. Maize tetraploids do not breed true for chromosome number owing to irregular chromosome pairing but apparently one or a few chromosomes more or less than normal have no appreciable effect on inbred tetraploid strains which are very uniform. Tetraploid strains are highly cross-sterile with diploid strains in both direct and reciprocal crosses.

695. 633.15:577.86:581.465
JONES, D. F. 633.15:575.113:577.86
Unisexual maize plants and their relation to dioecism in other organisms.
Proc. Nat. Acad. Sci. Wash. 1934 : **20** : 39–41.

The occurrence of dioecious forms in a species hitherto lacking such forms, and their continued propagation through four generations illustrates the working of specific germinal factors resulting in sex separation.

Dioecious maize has been developed by combining the two recessive genes tassel-seed-2 (ts_2) and silkless (sk) located in chromosomes I and II. Plants that are ts_2ts_2 sk sk are functionally female with carpellate instead of staminate flowers in the terminal inflorescences. The heterozygous Ts_2ts_2 sk sk plants are males with the normal staminate terminal flowers. The lateral inflorescences in both sexes are entirely sterile, so that seed parents produce only seed, and pollen parents only pollen.

The ts_2 gene not only suppresses the staminate flowers in the terminal inflorescences, but also forces normally aborted ovules into full growth producing the crowded and irregular arrangement of seeds in the lateral inflorescences of tassel-seed plants, whence ts_2 is regarded as a female-promoting gene. The sk factor suppressing the carpellate flowers in all parts of the plant is regarded as a male-promoting gene.

The interaction of two specific loci holds the balance of control over the other germinal factors and over the environmental influences and supplies a mechanism for the production and maintainance of the dioecious condition.

696. SAULESCU, N. and GLUSCO, B. 633.15–1.421:581.162.32
Über die Nachbarwirkung in Sortenversuchen mit Mais. (**On vicinism in varietal tests of maize.**)
Fortschr. Landw. 1933 : **8** : 370–72.

Varietal tests of maize shewed that individual plots had no mutual influence on the yield of neighbouring plots except when very widely differing varieties were sown side by side. A 3-year experiment on varieties with different times of ripening shewed that only varieties with the same or a similar time of maturity should be tested in adjacent plots.

697. 633.15–2.42–1.521.6
HAYES, H. K., JOHNSON, I. J. and STAKMAN, E. C.
Reaction of maize seedlings to *Gibberella saubinetii*.
Phytopathology 1933 : **23** : 905–11.

Using the same strain of *G. saubinetii* and the F_4 and F_5 generations from the maize crosses described by McIndoe (see " Plant Breeding Abstracts," Vol. II, Abst. 86), the correlation between the reaction of rows in the different replications from the seed of the same ears and also interannual F_3–F_5 correlations and similar correlations for selfed lines of Crosby and Golden Bantam were made in order to determine the inheritance conditions. The combinations resistant x susceptible, susceptible x intermediate and its reciprocal and also susceptible x susceptible were represented in the crosses.

It was found that the progeny of individual ears were relatively constant in the extent of seedling blight, although inheritance was not apparently the main cause of uniformity of reaction in different replicates. It seems safe to conclude, therefore, that the conditions under which an ear develops determines in some way the manner of reaction of the progeny.

The method here described is thus of little or no value in maize breeding.

698. REDDY, C. S. 633.15–2.484–1.521.6:581.198:575
Resistance of dent corn to *Basisporium gallarum* Moll.
Res. Bull. Iowa Agric. Expt. Sta. 1933 : No. 167 : Pp. 40.

Maize strains which germinate readily below 11°C. are only slightly injured by *B. gallarum*, whereas strains requiring temperatures above 11°C. for germination are severely injured by infection. This correlation may be made the basis for breeding strains resistant to seed rotting by *B. gallarum* at the time of germination.

Resistance to infection was found to be related to the pH value of the cob, ears with a high hydrogen ion concentration being resistant and those with a low pH value being susceptible. The critical point dividing these two classes was about pH 5·2.

A comparison of the open pollinated and inbred strains of maize indicated that this cob reaction was heritable and it therefore promises to be of assistance in breeding for resistance to *B. gallarum*. Moreover, it should be possible by means of tests on a number of cobs to determine whether or not an inbred strain is homozygous for the character. Since the reaction does not depend on the presence of infection in the cob, the test can be used in any year whether an epidemic has occurred or not.

Reference is made to work at Iowa Station where data indicating the dominance of resistance to *B. gallarum* have been collected.

A bibliography concludes the paper.

BARLEY 633.16

699. PECH, W. 633.16
Betrachtungen über neuartige Merkmale zur Sortenbestimmung bei Gerste.
(Considerations of some new characters for the identification of varieties of barley.)
Kühn–Archiv 1933 : **38** : 378–82.

An examination of the rachis of various varieties of barley with the help of a lens shews differences in the pubescence of the margin of the rachis which is either smooth or bushy and in the presence or absence of hairs of the lowest internodes of the rachis.

Although pubescence of the margins of the rachis and of the basal bristle and outer glume always occur together and are regarded as shewing linkage, differences in degree of thickness of the hairs may occur in one and the same ear.

A further important character is the structural type of the rachis, differences in the breadth and length of the individual nodes and in the straight or curved outline of the margin of the rachis, that is, whether the grains are set straight or at an angle from the rachis.

The use of these characters helps considerably in the identification of varieties that are otherwise difficult to separate.

700. 633.16:575
COLIN, H. 633.16:575.061.6
La descendance de l'hybride Orge noire et lisse x Orge blanche et rugueuse.
(The progeny of the hybrid black-smooth barley x white-rough barley.)
Bull. Soc. Bot. Fr. 1933 : **80** : 537–42.

In 1920 a black-smooth variety of barley, probably belonging to the Algerian form *Hordeum leiorrhynchum*, was crossed by a white-rough form Albert. In F_1 no well formed white grains appeared but the awns were black, grey or white, while roughness was intermediate. In earliness F_1 was equal to the black parent ; colour and vigour were intermediate. In F_2 the nine typical segregating classes were obtained. The black-rough complex continued to segregate up to F_6 when all ears were black or grey without any whites, all being also intermediate half-rough forms. F_7 was approximately homogeneous consisting of black, rough ears and this hybrid complex remained fixed, no whites or changes in the degree of roughness being found subsequently.

The white-rough type of the parent form shewed some variation in roughness but proved homogeneous from F_6 onwards.

On sowing the black-smooth forms in F_2, the progeny were black or grey never white-eared, while smoothness predominated though some somewhat rough ears were fairly frequently found interspersed on a plant. From this finding which is contrary to the general opinion, the author concludes that, properly speaking, smooth ears do not exist, the distinction between rough and smooth being merely one of degree. In F_5 the smooth ears still produced some half-rough forms but by continued selection for the smoothest types a homogeneous progeny was obtained in F_7.
The black-smooth complex proved stable as regards colour, but though only one plant with half-rough ears was subsequently found, the author gives reasons for believing that though the character roughness may be temporarily lost it may subsequently reappear.
The grey-rough complex ceased to segregate after F_6. The grey colour can easily be fixed provided the influence of climate can be excluded.
The black, white or grey half-rough types segregate somewhat after the fashion of rough forms of the corresponding colours and the fully rough ears occurred again until in the 6th or 7th generation the half-rough type was more or less fixed.
The more difficult reciprocal cross white-rough Albert x black-smooth resulted in hybrid grains that were white, the F_1 ears being black and rough.

701. WEXELSEN, H. 633.16:575.116.1
Quantitative inheritance and linkage in barley.
Hereditas 1934 : **18** : 307–48.

The present paper is a continuation of the work already noted (see " Plant Breeding Abstracts," Vol. III, Abst. 653) and represents a more complete study of the factors concerned with the internode length of the spike ; by a determination of the linkage relations of these with certain qualitative factors, it is possible to study the effect of each factor alone or in combination with other factors.
Varieties of *Hordeum tetrastichum, H. pyramidatum* Kcke. and *H. distichum nutans* were used in the experiments. Long and short rachilla hairs segregated monofactorially, long hairs, L, being completely dominant to short. Rough versus smooth awn R–r was monofactorially inherited except in one cross in which another factor was present giving intermediate types. Large teeth on an inner dorsal nerve of the lemma G–g and two-row versus six-row Z-z also shewed a one factor inheritance.
Linkage with about 30 per cent crossing-over was found between L and R and linkage between G and Z with about 12 per cent crossing-over. The study of the inheritance of a series of internode lengths with mean values from about 1·50 mm. to 4·00 mm. shewed that probably as many as six factors L_1–L_6 are involved. These do not behave as multiple factors in producing an orderly series but the factors have very different effects, for instance, the change from the short to the long type may be made by one factor or by two or three.
The effect of these factors in the heterozygous condition also varies, L_1, L_2 and L_3 being intermediate, while L_4 lies nearer to the short type and L_5 to the long.
In a cross between two varieties of the *pyramidatum* type, there was transgressive segregation both above and below the parent types and among the F_3 some plants of the *parallelum* type occurred.
The recessive factors l_5 and l_6 in the homozygous condition both produce the shorter, lower internodes which are characteristic of the pryamidal shape of spike.
Linkage with about 40 per cent of crossing-over was found between Z and L_4 and the data clearly indicated linkage between G and L_4 but no calculation of the cross-over value could be made. There was evidence for a correlation between a factor for early heading and the factors G and Z. Combining the results of other writers, linkage group I therefore contains, besides a factor for awns and one for early heading, also Z, G and L_4, but the exact position cannot yet be determined. A further correlation was found between a factor for earliness and the factor R and L, so that the second linkage groups contain besides these factors, the factor for lemma colour and albina t.

702. Nikolič, N. 633.16:576.16
Příspěvek k otázce vzniku hlavních druhů ječmene. (**On the question of the origin of the main varieties of barley.**)
Věst. (Bull.) Českoslov. Akad. Zeměd. 1933 : **9** : 505–07.
A preliminary contribution in which the author's scheme of classification of barleys to shew their phyletic relationships is presented. The work of other investigators is also discussed.

703. Ménéret, G. 633.16:581.48.04
Réaction colorée des grains d'orge par traitement à l'acide phénique. (**Colour reaction of barley grains on treatment with carbolic acid.**)
Sélectionneur 1933 : **2** : Fasc. 3 : 10–15.
A method of distinguishing barley grains which, in the author's opinion, is of especial interest for classifying 2-rowed barleys in view of the small number of serviceable distinctive characteristics for identifying such forms.

704. 633.16–2.484–1.521.6:575
Shands, R. G., Leith, B. D., Dickson, J. G. and Shands, H. L.
Stripe resistance and yield of smooth-awned barley hybrids.
Res. Bull. Wis. Agric. Expt. Sta. 1933 : No. 116 : Pp. 22.
A smooth awned, white hybrid barley was obtained from a number of pedigreed Oderbrucker x *leiorrhynchum* crosses, the Oderbrucker variety having rough awns and the *leiorrhynchum* variety being a small, black, smooth awned barley. As regards stripe disease (caused by *Helminthosporium gramineum* Rabh.), a wide range of variation from susceptible to highly resistant selections was found. Back-crossing to the Oderbrucker parents resulted in increased susceptibility to stripe disease.
The infection in a given selection seems to be correlated with environment during the flowering and seedling stages and the same environment seems to affect the development of stripe disease differently in the various selections.
The resistance of the smooth-awned selections under field conditions was also confirmed by results obtained from artificial inoculation.
The highest yielding hybrid selections matured 4-5 days later than the Oderbrucker, yet in the dry season of 1931 two selections yielded as well or better than the Oderbrucker. In the hybrids the hull was slightly darker in colour, and the smoothness and flexibility of the awns with somewhat looser glumes than the Oderbrucker renders threshing without husking difficult ; the malting quality equals that of the Oderbrucker form and two above mentioned pedigrees have consistently out-yielded the latter variety by about 10-20 per cent. Among the resistant selections was one that under all conditions has remained free from stripe disease for three successive years.

MILLETS AND SORGHUMS 633.17

705. 633.17:581.19
Ireland, J. C. and Yeats, P. A. 633.17:575.061.6
Chlorophyll content of grain sorghums.
Bot. Gaz. 1933 : **95** : 300–15.
In the course of a multiple correlation study begun 4 years ago on a variety of plants from selfed seed of kafir sorghum from a Blackhull White x Japonica cross observations on the chlorophyll content were included. A photo-electric colorimeter and a Zeiss microspectroscope were used in the chlorophyll estimation ; and a microspectro-colorimeter gave good results in comparing chlorophyll solutions as did also an improved form of apparatus for rapid and uniform chlorophyll extractions.
A positive correlation between the yield and the chlorophyll content was found and varietal differences in the latter seemed to be consistent throughout the growing season.

706. 633.17:581.48:575.061.6
SIEGLINGER, J. B. 633.17:581.46:575.061.6
Inheritance of seed color in crosses of brown-seeded and white-seeded sorghums.
J. Agric. Res. 1933 : **47** : 663–67.

The practical and theoretical importance of combining the desirable characters of brown-seeded sorghums with the white-seed character led to the investigation of seed colour inheritance in the following three crosses : (1) Scarborough broomcorn (C.I.[3] No. 817) x a white-seeded fixed segregate of Freed sorgo x Evergreen Dwarf broomcorn, (2) Blackhull kafir (C.I. No. 813) x Darso, and (3) Blackhull kafir (C.I. No. 813) x Sumac sorgo (F.C.I.[4] No. 1712). Scarborough broomcorn has brown seeds, Blackhull kafir, white seeds, Darso, reddish-brown seeds and Sumac sorgo, dark walnut brown seeds.

The seed colour factors in these crosses are designated :— B, a factor for brown nucellar layer which also causes a brown in the epidermis ; b, its allelomorph for absence of the brown nucellar layer ; R, a dominant factor for red or yellow in the outer layers of the pericarp ; and r, its allelomorph for lack of red or yellow in this region. Though to the eye the colour of the seed of red kafirs and yellow milos appear different, results are quoted to shew that the two seed colours observed in these two types are conditioned by the same genetic factor R.

The experiments shewed that brown seed colour of Scarborough broomcorn, Darso, and Sumac sorgo is the result of two seed-colour factors, B and R.

A close approximation to a dihybrid ratio was obtained for the segregation of brown, yellow and white-seeded plants in all three crosses and on the basis of further work with some F_3 generations the factorial constitution BBRR is attributed to Scarborough broomcorn, Darso and Sumac sorgo and the constitution bbrr to the white-seeded varieties.

Awnedness and stigma colour were also studied each in one cross ; no linkage was apparent between seed colour and awn factors, but yellow stigma was completely associated with the presence of R.

RICE 633.18

707. CHIAPPELLI, R. 633.18(45)
Nuove varietà di riso. (**New varieties of rice.**)
G. Risicolt. 1934 : **24** : 16–20.

The hybrid rice obtained from a cross of the varieties of rice, Roma (a variety derived from Lady Wright) and Chinese Ostiglia, displayed many of the characteristics of the parents and had awned caryopses of a bright yellow colour as in the Chinese Ostiglia parent and long narrow and transparent as in the Roma type. Among the subsequent segregates from this hybrid one form appeared remarkable for the size and weight of its caryopses which were larger than those of any Italian or, as far as is known, of any foreign variety either. By subsequent pure line selection for greater uniformity in regard to height, time of ripening and a large and vitreous type of grain, a strain, No. 279, was extracted with the following characteristics among others : height 78–80 cm. ; panicle with unawned caryopses ; occasional rudimentary awns ; golden yellow glumes ; time of ripening a few days later than the variety Americano ; length of caryopses 10·50 mm., facial diameter 3·80 mm. ; lateral diameter 2·45 mm. ; weight of 1,000 grains 48 g. The variety is to be multiplied in the coming year.

By inbreeding 12 other also superior strains from the same original cross a strain called Mantova was selected which resembles somewhat strain No. 279 in resistance to lodging and in the panicle and glume characters. The caryopsis is translucent and in size and weight of seed it may be regarded as the best of the existing varieties in Italy ; and its yield was fairly high.

708. WYCHE, R. H. and BEACHELL, H. M. 633.18(76.4)
Varieties of rice for Texas.
Bull. Tex. Agric. Expt. Sta. 1933 : No. 485 : Pp. 22.

Yields of 88 varieties of rice grown in Texas from 1914-1932 with data on grain type, time of maturity and milling quality of the better varieties.

709. 633.18:575.11
633.18:575.061.6
JONES, J. W.
Inheritance of characters in rice.
J. Agric. Res. 1933 : **47** : 771–82.

The inheritance of glume length, absence of ligules, brittleness, shattering, dwarfness, degree of awnedness, colour of awns, of glumes and of apiculi, of lemma and palea furrows, and finally earliness were investigated in a number of varieties.

The long-glumed and short-glumed varieties used differed by a single genetic factor for glume length, short glumes being dominant to long ones. A similar genetic basis was found to underly absence of ligules, brittleness and shattering, the normal condition being dominant for all three characters.

Dwarfness proved to be a simple recessive to the normal form.

As regards awnedness, various crosses revealed that the fully awned varieties used differed from awnless varieties by two genetic factors, fully awned varieties differed from partly awned by a single genetic factor, and partly awned varieties differed from awnless varieties by a single dominant genetic factor.

Red colour in the awns, glumes and apiculi was dominant to green or, at maturity, straw colour.

In the cross Colusa x Aikoku the difference in awn colour apparently was due to a single genetic factor, whereas in the crosses Caloro x Aikoku and Caloro x Butte the difference appeared to be due to two complementary genetic factors.

Brownish yellow colour of lemma and palea furrows appeared to be inherited independently of long glumes and was dominant to straw colour, two complementary factors being probably involved.

In contrast to the reports of other observers, earliness behaved as a simple recessive. It is pointed out that the factorial relationships for this and other characters in rice varies with the varieties used.

710. KONDÔ, M. and ISSIKI, S. 633.18:575.242
On the occurrence and inheritance of two teratological forms of rice.
Nôgyô Kenkyû (Landw. Studien) 1933 : **20** : 135–53. (Japanese).

Two mutant forms both recessive to the normal type and both conditioned by single factor differences are reported.

The abnormalities in one mutant consisted in the absence of the median rib in the leaf which was also twisted at the base, abnormal branching of the stem, the occurrence of two periods of earing and complete sterility due to foliar degeneration of the carpel. In chimaeric plants the normal portion developed normally.

The second mutant was characterised by abnormally narrow leaves, and open glumes on the caryopsis owing to weakness which prevents their closing after fertilization. Also, the grains are small and misshapen.

LEGUMINOUS PLANTS 633.3

711. BAUR, E. 633.367:575(43)
Der Stand der Süsslupinenzüchtung. (**The position in sweet lupin breeding.**)
Deuts. landw. Pr. 1933 : **60** : pp. 2.

Strains of sweet varieties of *Lupinus luteus*, *L. angustifolius* and *L. albus* are now under propagation at Müncheberg and should prove valuable fodder plants. *L. luteus* has, however, the defect that the pods split at an early stage and *L. angustifolius* too has the disadvantage that the pods readily split and the seeds are shed and the yield thus reduced. (See Abst. 713).

This defect may be to some extent counteracted by sowing an admixture of oats and mowing the crop at night. The yield of seed obtainable from *L. albus* depends greatly on external conditions of weather and climate but if a suitable environment is selected this sweet lupin should prove a valuable green fodder crop. Promising work on the development of an earlier type of *L. albus* is in progress.

The investigations in progress on lupins as a possible source of oil have already been referred to (see Abst. 634). Details of the experiments on other new unnamed plants yielding high percentages of protein and fat are not disclosed.

712. SENGBUSCH, R. v. 633.367:575:578.08
Die im Boden liegenden hartschaligen noch keimfähigen Lupinen und ihre praktische Bedeutung für die Reinhaltung von Lupinen-Zuchtmaterial. (**The hard shelled lupins left in the soil and still capable of germination and their practical importance in maintaining the purity of lupins destined for breeding material.**)
Züchter 1933 : **5** : 26–28.

The conditions of crop rotation, fallowing, etc., are discussed under which an undesirable admixture of bitter lupins arising from hard seeds lying hidden in the soil may occur. Data collected from a number of plots illustrate the necessity for attention in breeding work to this possible source of contamination of sweet lupins that are being propagated.

713. SENGBUSCH, R. v. 633.367:581.47
Die Züchtung von Lupinen mit nichtplatzenden Hülsen. (**Breeding lupins with non-splitting pods.**)
Züchter 1934 : **6** : 1–5.

In an attempt to obtain a type of lupin with pods that do not split and shed their seeds a method was evolved whereby some millions of plants could be tested individually and independently of weather conditions. The technique depends on a drying process for which the optimum temperature and duration are 60°C. and 72 hours respectively. In determining the temperature it is essential that the germination capacity must remain unimpaired and the duration of the temperature treatment must be such that all non-splitting types burst open.
Field observations with subsequent confirmatory tests by artificially induced splitting shewed that some derivatives of *Lupinus albus* and *L. mutabilis* shewed complete absence of splitting of the pods.
An apparatus is described by means of which many millions of plants of *L. luteus* and *L. angustifolius*, the two varieties mainly cultivated in Germany, may be tested for the character in question. The cost of the apparatus and the running expenses would be small in comparison with the gain to be derived from the increased crop yields that could be obtained by breeding varieties with non-splitting pods.

ROOTS AND TUBERS 633.4

714. 633.42
LATHOUWERS, V. 635.34
La taxonomie des *Brassica* cultivés. Un essai de mise au point. (**The taxonomy of the cultivated species of *Brassica*. An attempt at co-ordination.**)
Bull. Inst. Agron. Sta., Recherches Gembloux 1933 : **2** : 3–16.

An attempt to clear up the existing confusion among botanical names in the genus *Brassica*, special attention being devoted to those species which are the main subject of controversy, *e.g.*, the turnip, rape, cabbage-turnip, colza and navette.
A detailed classification of all cultivated species of the genus including *B. oleracea* (common cabbage) based on the classification of Schulz, Engler and Hegi, is appended. The French, German, English and Dutch equivalents are also given.

715. KONDÔ, M. and ISSIKI, S. 633.42:575.11:581.45
The occurrence and inheritance of abnormalities in *Brassica*.
Nôgyô Kenkyû (Landw. Studien) 1933 : **20** : 155–83. (Japanese).

Out of 33 families obtained by selfing plants from commercial seeds of a type of *Brassica chinensis* with entire leaves, 24 exhibited the following leaf abnormalities :— excessive lobing, the leaf lamina being reduced in some instances to a very narrow border along the midrib, and in some cases also the presence of 2–4 lobes at the base of the leaf. The last named condition is attributed to the action of two kinds of polymeric factors K and L. The presence of 3–4 of these factors results in 4 or more lobes, the presence of only 1–2 in 2–3 lobes. The absence of K and L or their presence accompanied by an inhibitor I_2 renders lobe development impossible.

716. 633.491:575
STUART, W. 633.491:575.19
The activities of the international commission for the study of the potato.
Amer. Pot. J. 1934 : **11** : 20–23.
The immediate aim of the International Commission for the study of the potato, appointed in 1931, is the collection and classification of all available data on the world's potato varieties and the ultimate establishment of some centre where all such information would be available to those interested in potato improvement. The commission will also encourage a study of the genetic inheritance or composition of as many varieties as possible, especially of representative families or groups, with the object of securing information on disease resistance or disease inheritance factors, heat, drought, or cold resistance, regional adaptation, length of day responses, vigour, productivity, tuber shape, table quality, etc.
The report published by Dr. von Rathlef on potato families or branches of the world and their seedling progenies (see " Plant Breeding Abstracts," Vol. III, p. 154) is briefly discussed ; and it is suggested that in order to avoid errors in systematic classification, manuscripts on this aspect of the subject should be considered collectively.
A request to readers is made for information on the following points which are of interest to the plant breeder ; the behaviour of varieties, whether it be with respect to character of soil, resistance to disease, insects, cold, heat or drought.

717. STUART, W. 633.491:575(73)
Progress in potato breeding and selection.
Read at Ann. Meet. Conn. Veg. Grow. Ass., Dec. 4th, 1929.
The past and present position of potato breeding and selection and the various methods used and the general progress made are surveyed and the history of the original work in Maine on blight resistance and the subsequent continued efforts to breed virus resistant or immune seedlings for the past 15 seasons are outlined.
From 100,000 seedlings no named variety has yet been distributed, but one 1923 seedling seems to be resistant to the virus diseases as well as producing a vigorous plant and a large yield of well-shaped and attractive tubers. Tubers from this seedling and from two others are regarded as promising material for future trials. Other more recent seedlings may also prove able to stand the tests of disease and unfavourable growing conditions.
Increased financial support from the United States Government will now enable the U.S. Department of Agriculture with the active co-operation of several state experiment stations to develop to the fullest possible extent a comprehensive scheme for the production of new and better varieties and of improved strains of seed potatoes. One of the many difficulties so far encountered has been the lack of available land to permit of the necessary isolation for the development of strains under healthy conditions.
It is recognized that the most up-to-date breeding methods including the raising of larger numbers of seedlings is essential, if a really superior plant, highly disease resistant and producing a large yield of superior quality tubers is to be produced. A further extension of a combined attack on the problem of potato breeding and selection is expected to result from the conference held in Chicago (March 1929) at which numerous states were represented. Mutual co-operation among various states in testing the varieties developed by the different experiment stations is regarded as an important part of the programme. In conclusion, supplies of seed were offered to those stations wishing to join in the project.

718. RATHLEF, H. von 633.491:581.331.2:575
Materialien zur Kenntnis des reifen Pollenkornes des Kartoffel, III. (**Material towards the knowledge of the mature pollen grain of the potato, III.**)
Arch. Pflanzenbau 1934 : **10** : 558–72.
In continuation of work already noted (see " Plant Breeding Abstracts," Vol. III, Abst. 234), a list is given of 228 European and 75 Peruvian varieties with the number of pollen grains

in each case seen in the microscopic field of vision, the percentage of grains which germinate and the quality class for each variety.
As a result of four years investigations the author concludes that the majority of the potato varieties in the temperate zones are only pollen fertile to a slight degree and that various climatic and biological factors favour the production of fertile pollen. Pollen with less than 30 per cent of grains which germinate offers only a poor prospect for setting seed.
An aqueous solution of methyl green and acetic acid is a useful reagent for the microscopic examination of the quality of the pollen.
The group of cultivated potatoes from the high Andes have pollen of a better quality than that of the most pollen fertile varieties of temperate zones and it is hoped that by means of crossing, this quality may be added to European varieties.

719. 633.491:608.3(43)
Prüfung von Neuzüchtungen von Kartoffeln. **(Testing of new sorts of potatoes.)**
Züchter 1933 : **5** : p. 284.
A statement issued by the Commission for the Registration of potato varieties and giving the requirements in Germany for the testing of new sorts of potatoes.

720. SCHMIDT, 633.491–2.411.4–1.521.6:575
Die Züchtung phytophthora-widerstandsfähiger Kartoffeln. **(The breeding of potatoes resistant to *Phytophthora*.)**
Deuts. landw. Pr. 1933 : **60** : p. 485.
The present aims in potato breeding are quality and uniformity of yield. For the latter high yield is not enough but strains are desired whose yield is independent of climatic variation and which are above all that are resistant to disease.
Until recently there were no satisfactory measures for the control of *Phytophthora* and no resistant varieties existed among the cultivated sorts. By crosses with wild varieties Müller was able to produce resistant strains which, however, had to be repeatedly crossed with cultivated varieties to eliminate many undesirable characteristics.
These resistant strains were growing at Streckenthin when in 1932 they, as well as the original strains, suddenly succumbed to an attack of *Phytophthora* (see "Plant Breeding Abstracts" Vol. III Abst. 673). The cause is yet unexplained but is probably due to a new physiological strain of the attacking organism.
Fortunately there were growing at Streckenthin strains derived from crosses between the cultivated varieties and *S. antipovichii*, *S. ajuscoense*, *S. demissum* and *S. verrucosum*. Some of these strains were susceptible to the new biotype but some were resistant. The resistant strains were always later in maturing than the cultivated varieties with the same maturing period. Experiments in spraying shewed that it was possible to prevent attack of the early cultivated varieties by *Phytophthora* and that for early kinds a partial and not a complete resistance was desirable. Medium late maturing varieties, however, should be completely resistant.

721. 633.491–2.482–1.521.6
SENGBUSCH, R. v. 635.64–2.482–1.521.6
Das Verhalten von *Solanum racemigerum* gegen den Erreger des Tomatenkrebses (*Didymella lycopersici*). **[The reaction of *S. racemigerum* to the pathogen of tomato wart (*D. lycopersici*.)]**
Züchter 1933 : **5** : 25–26.
Since *S. racemigerum* is susceptible to *D. lycopersici* and no resistant forms are yet known a search must be made for resistant types among forms related to the cultivated tomato.

722. Balsac, H. de and Roehrich, 633.51(59.7)
Étude de cotons du Cambodge. (**A study of cottons of Cambodia.**)
Coton et Cult. Coton. 1933 : 8 : 29-36.

A brief discussion of new cotton types developed from indigeneous varieties. According to technological reports the types No. 4, Short Pistil, Klay II (from Kompong Speu) and Klay II (from Petit Takeo Agricultural Station) are of good length, fineness and maturation. They should be grouped with Egyptian Uppers among the " fully good fair " class.

723. Pudovkina, Z. M. 633.51:575.42
(**Commercial selected cotton varieties.**)
NIHI, Moskow and Tashkent, Central Breeding Station, 1933.

It is desired to raise the yield of cotton by 15-20 per cent in 1933 and by 75 per cent during the second Five Year Plan, without deterioration in fineness, torsion and strength of fibres and with an increase, if possible, in lint length.

From these points of view descriptions are given of the main varieties in cultivation, together with a number of new varieties capable of replacing them. The type of growth, leaf, flower, boll (including weight of lint), seed, lint characters such as colour, length and ginning out-turn, and agronomic characters such as yield, earliness, resistance to drought and disease are indicated first for the main Egyptian cottons, and then for certain new selections of Egyptian cotton, produced by NIHI. These include a Pima selection earlier than Pima by 3–7 days, outyielding it by 20–35 per cent and giving a greater ginning out-turn by 4–7 per cent and lint 36–38 mm. in length ; another Pima selection outyielding the original by 30 per cent and otherwise of similar quality ; a selection of Boss giving 50 per cent higher yield of lint than Ashmouni ; and a Pima selection with a very long lint, 1–2 days later in maturity than Ashmouni, which it outyields by 13 per cent. There follow similar descriptions of new ultra-early Upland selections made by NIHI from the variety Schroeder, and from various commercial mixtures, and of a number of mid-early and mid-late selections and hybrids.

By reference to a group of high-yielding American varieties the possibility of combining high yield with high ginning percentage, and long staple is illustrated. This group, referred to as " the 8,000's," has been produced by the Central Breeding Station from various American varieties and they are being rapidly multiplied to replace Navrotskii.

Descriptions are given of certain Upland hybrids which combine especially long staple with large boll and a fair degree of earliness.

The varieties which it is proposed to cultivate in the different regions in the second Five Year Plan are indicated in a table.

724. Stets, (V). 633.51:581.143.26.03
(**Vernalization of cotton seeds by T. D. Lyssenko's method.**)
New Methods of Cotton Culture, published by NIHI, Moskow and Tashkent 1933 : 88–91.

Experiments were conducted by the method recommended by the Ukrainian Breeding Institute,[1] the air temperature however being 3–5°C. higher than that recommended (15–17°C.) and the soil temperature also being slightly too high.

Navrotskii and Ashmouni cottons were used, both experimental and control seeds being previously soaked for 1 to 2 days. Sowing was carried out on May 5th.

On May 18th observations were made on the seedlings, which shewed that the vernalized plants were more vigorous, strong and healthy than the controls, being fresher, larger and denser, in the case of Navrotskii, but in Ashmouni little difference between the two was detectable. The speed of germination was greater in the treated plants, and the percentage germination was also higher as seen from this table :—

[1] Method not described.

Condition of Seed	Number of plants per ha.	Percentage
Vernalized seeds of Ashmouni ...	145·790	117·7
Control Ashmouni	123·820	100
Vernalized seed of Navrotskii ...	78·750	182·8
Control Navrotskii	43·060	100

In respect of the density the vernalized seed gave results intermediate between the control and delinted seed viz. :—

Condition of Seed	Number of plants per ha.	Percentage[1]
Delinted seed dry...	130·400	
,, ,, soaked	124·900	
1 Mean	127·650	296·4
2 Vernalized ...	78·750	82·8
3 Control	43·063	100

From these results the author concludes that it is necessary to work out a method for vernalizing cotton for the conditions of Central Asia. He is also inclined to think that the repeated moistening and spreading during the process of vernalization, leading to a matting of the lint and fuzz, is largely responsible for the better germination of vernalized Navrotskii seed, owing to the superior capacity for absorbing water. This also accounts for the less pronounced effect observed in Ashmouni with naked seeds.

725. KONSTANTINOV, N. N. 633.51:581.143.26.035
(Photoperiodism.)
New Methods of Cotton Culture, Published by NIHI, Moskow and Tashkent, 1933 : 91–94.

Many of the perennial cottons are of great value on account of their boll size, disease resistance, etc. By growing them under conditions of reduced illumination, 8–9 hours daily, their flowering and maturity can be accelerated by several months and they can be crossed with the annual forms. Crosses have been made in this way with the Egyptian cottons to increase the boll size of the latter, which has hitherto been impossible, no large-bolled Egyptians being known. Peruvian and Colombian perennial cottons nearly allied to the Egyptians and having bolls weighing 6–7 gm. have been used in this way and the hybrids are now in the third generation. Experiment has shewn that the reduction in length of day need be applied only in the early period of development, for about 1½ months in the case of perennial cottons and even less for earlier varieties. This makes it possible to treat large numbers of seedlings which are later transplanted into the field. The onset of sympodial branching and flowering can be similarly accelerated in Egyptian cottons and others. Complete darkness is not essential, the effect can also be produced by periods of " twilight."

[1] Figures as given in table in text.

726. MALZEV, A. M. 633.51:581.143.26.04
(The question of artificially inducing maturity in cotton.)
New Methods of Cotton Culture, published by NIHI, Moskow and Tashkent, 1933 : 40–56.

The use of ethylene in bringing unripe fruits of many plants to maturity is discussed. Experiments are then described in which immature cotton bolls (40–50 days) were subjected to ethylene treatment, two controls being dried in the sun and left on the tree respectively. No positive effect of the ethylene was detected in the weight of the fibre, weight of seed or size of bolls nor in the germinating power of the seeds and in the majority of cases the ethylene treatment gave results even inferior to that of sun drying. The somewhat greater length of lint is shewn to be a general property of immature seeds.
The difference in reaction of the cotton fruit and dessert fruits is considered to result from the desiccated nature of the cotton fruit at maturity and the fact that the product of cultivation is a fibre and not the fresh fruit.

727. KHARKOV, D. V. 633.51:581.48:578.088.1
(Results of experiments with biontization of cotton seeds.)
New Methods of Cotton Culture, published by NIHI, Moskow and Tashkent, 1933.

The author failed to observe regular and significant stimulating effects of various chemicals such as have been reported by other investigators. Some experiments gave slightly positive yield differences, others negative, and the majority shewed no effect of the stimulant whatever. The author counsels caution in drawing conclusions from experiments of this kind. Above all it is essential to work with pure line material and to have an adequate system of controls.

728. HARLAND, S. C. 633.51–1.525
De l'acclimatement des cotonniers en de nouvelles zones. **(The acclimatization of types of cotton in new regions.)**
Coton et Cult. Coton, 1933 : **8** : 91–98.

The results of natural and artificial selection are compared and the importance of considering the genetic constitution of cottons in any attempts at their acclimatization to new conditions is pointed out. The Upland type is regarded as unlikely to adapt itself to tropical conditions though instances of moderately good adaptation have been recorded in certain parts of Africa and in North West India.
Such exceptional adaptable forms are stated to resemble more primitive or older types in which the genes necessary for adaptation to the new conditions had not yet been eliminated by selection.
Marked diversity of genetic content is essential for successful acclimatization and the forms destined for adaptation should possess as many heterozygous genes as possible conditioning the physiological characters.
The method of isolating pure lines by crossing and establishing populations and finally selecting suitable plants for pedigree culture is exemplified by a hypothetical Bourbon x Upland cross. The wild cottons, *G. Darwinii*, *G. tomentosum*, *G. taitense*, *G. purpurascens* (including Brazilian Moco and Gambia Native) and Ishan, Tanguis and Gambia Peruvian are recommended as a basis for the establishment of populations.

729. STETS, V. 633.51–1.547.1
(Sowings of cotton seed chemically delinted by strong sulphuric acid.)
NIHI, Moskow and Tashkent, 1933.

The treated seeds germinated better and earlier (by 2–3 days) than untreated, and the method has many other attendant advantages.

730. BLARINGHEM, L. 633.52:581.143.26:581.162.5:575.42
L'habitus des lins en rapport avec leur fecondité et leur sélection. (**The growth of flax plants in relation to their fertility and selection.**)
C.R. Acad. Sci. Paris 1933 : **197** : 505–08.

During selection of a large number of lines of flax (*Linum usitatissimum* L.) it was observed that in normal years the most stable lines had always shorter stems than the unstable lines isolated from the same population.
Some of these lines were crossed and the many variations among the hybrids are described. It was found that the stem continued to elongate until the plant dried off and gave long, supple fibres ; this behaviour however was correlated with a marked reduction in fertility and an instability which reduces their economic value.

731. BESSEY, E. A. 633.522:577.8
Sex problems in hemp.
Quart. J. Biol. 1933 : **8** : 194–200.

After a review of the problems and conflicting results of work on sex in hemp the author suggests the theory that a change in metabolic rate will cause a change in sex expression. If the change is not very marked intersexed plants will be produced.

732. SAX, K. and MCKELVEY, S. D. 633.526.2:576.312.35
Taxonomic and cytological relationships of *Yucca* and *Agave*.
J. Arnold Arb. 1933 : **14** : 76–80.

Although *Yucca* is placed by taxonomists in the *Liliaceae* and *Agave* in the *Amaryllidaceae* the two genera are strikingly similar in many details.
Both shew 5 pairs of large chromosomes and 25 pairs of small chromosomes and a common origin is indicated.
The variability found in *Yucca* was not correlated with any variation in the number of chromosomes or with any irregularity in their behaviour.

SUGAR PLANTS 633.6

733. BRANDES, E. W., SHERWOOD, S. F. and BELCHER, B. A. 633.61
Sugarcane for sirup production.
Circ. U.S. Dept. Agric. 1933 : No. 284 : pp. 48.

In this Bulletin, mainly on sugarcane cultivation, the five main groups of species and the characteristics of various species and of interspecific hybrids are described.

734. KOENIG, M. 633.61(69.82)
Recensement des variétés de cannes cultivées à Maurice en 1933. (**Census of the varieties of sugarcane cultivated in Mauritius.**)
Rev. Agric. Maurice 1933 : No. 72 : 191–97.

Lists of the varieties cultivated by the sugar growers are given and the proportions in which they are grown.

735. BALCH, R. T. and LAURITZEN, J. I. 633.61–2.183
Windrowing qualities of Co. 281 and other varieties of sugarcane under Louisiana conditions.
Circ. U.S. Dept. Agric. 1933 : No. 304 : Pp. 14.

Co. 281, after 3 years' comparative trials with P.O.J. 36M, has shewn excellent keeping qualities when windrowed, being practically equal to the well-known variety D. 74.

736. 633.63:575
PROSKOWETZ, E. 633.63:575(43.7)
Die Entwicklung der Kultur und der Züchtung der Zuckerrübe. (**The development of the cultivation and breeding of sugar beet.**)
Verlautb. deuts. Sekt. mähr. Landeskulturrat. 1933 : **34/10** 37-39, 54-57, 72-75.

Sugar beet cultivation and breeding gave a considerable impetus to agriculture in the second half of the previous century. A clear distinction was made between the agricultural chemical

aspect and the physiological aspect of research. Working of the soil, drainage, manuring, etc., were further developed by the application of modern machines; experiments with manures, varieties, time of sowing, spacing, etc., gave indications of the proper methods to be used. The sphere of activity of entomologists and mycologists was enlarged. The author cites the excellently equipped research institute in Prague. The most important object in view, in addition to the increase of the root yield, which is conditioned above all by cultural factors, is the increase of the sugar content by means of plant breeding. The section relating to breeding opens with brief notes on distribution and history of the wild and cultivated forms of *Beta*, the breeding process and its adjuncts. The development of "breeding mainly on a chemical basis" is described and the value of the land races is shewn with special reference to the cereals. An historical survey of the sugar beet breeding centres within the Czecho-Slovakian Republic of to-day is followed by data on the effect of environment on breeding (the inheritance of acquired characters), which has as a consequence the fact that good breeding centres are limited to a few particular localities. The paper closes with a survey of the sugar yields from Achard's time up to the present day and some traveller's notes (1840–1850) from the diary of the author's father. A. B.

737. SPENGLER, O., BÖTTGER, S. and LINDNER, G. 633.63:581.192
(Working qualities of different beet varieties.)
Z. Ver. deuts. Zuckerind. 1933 : **83** : 895–931.

Experiments with a high tonnage variety, a high sugar variety and an intermediate variety, and also a variety with few leaves and one with much leaf, shewed that an ash analysis of beets is a good criterion of their workability in the factory.

738. WANTUCHOWSKI, J. 633.63–2.484–1.521.6:575
***Cercospora beticola*: its influence on beet experimentation and breeding. Importance of using disease resistant variety as trial standard emphasized by work of Polish Breeding Station.**
Facts ab. Sug. 1933 : **28** : 455–57.

The disturbing effects of *Cercospora beticola* on the evaluation of breeding investigations are demonstrated. The necessity of using a standard variety that is healthy and with a suitable degree of resistance so that comparative tests of breeding material may be validly made is exemplified from data in 1929 and 1931.

No immune variety has yet been found, the difference between varieties being that some are affected with the disease at an earlier stage of vegetation and others at a later stage. It is presumed that all varieties would ultimately succumb were the vegetation stage sufficiently prolonged.

STIMULANTS 633.7

739. GARNER, W. W. 633.71(73)
Cultivo del tabaco en los Estados Unidos. **(Cultivation of tobacco in the United States.)**
Bol. Union Panamericana 1933 : **67** : 402–13.

The cultivation of various types and varieties and a brief note on selection and seed preservation.

740. PIESCU, A. 633.71:575(49.8)
Cultura şi selecţiunea tutunului în România. **(Cultivation and selection of tobacco in Rumania.)**
Viaţa Agric. 1933 : **24** : 399–407.

A short account dealing with some of the varieties grown, the chief regions of cultivation and with selection for quality and disease resistance.

741. PIESCU, A. 633.71:575(49.8)
Tabakbau und Tabakzüchtung in Rumänien. **(Tobacco cultivation and tobacco breeding in Rumania.)**
Züchter 1933 : **5** : 114–20.

The most important varieties of tobacco grown in Rumania are enumerated and compared. Mass selection has been practised as a means of improvement and of maintaining good quality tobaccos ; but since 1930 individual plant selection with progeny tests and hybridization have been carried out at the Tobacco Research Institute at Băneasa, near Bucharest. The following breeding programme has been planned and has in part been begun :—Selection of pedigreed strains from indigenous varieties, and of lines with a low nicotine content ; isolation of disease resistant or immune varieties and their use in hybridization work.

742. 633.71:581.162.5:632.8
633.491:581.162.5:632.8
633.71:576.356:632.8
KOSTOFF, D. 633.491:576.356:632.8
A contribution to the sterility and irregularities in the meiotic processes caused by virus diseases.
Genetica 1933 : **15** : 103–14.

Observations are recorded on the occurrence of female sterility in certain *Solanaceae* when infected with an unknown virus.

The affected plants which were either pure species or species hybrids were female sterile and under unfavourable conditions the pollen too failed to function.

Graft experiments with various species of *Nicotiana*, *Datura* and *Solanum Lycopersicum* shewed that *N. glauca* could be infected and carry the cause of female sterility and transmit it to normal *N. tabacum*, *N. rustica* and *N. Langsdorfii* plants without itself displaying the symptoms which are attributed to infection by a virus termed the female sterility virus (see " Plant Breeding Abstracts," Vol. I, Abst. 551).

Mosaic disease too occasionally causes partial sterility in *N. tabacum* and *N. triplex*, the reduction division in the pollen mother cells being affected and a relatively high percentage of abortive pollen and pollen larger than normal and with a higher chromosome number being formed. The possible evolutionary significance of such phenomena which may tend to the production of polyploid and heteroploid plants is evident, and in the author's opinion virus disease may perhaps even play a contributory part in the production of mutations and chromosome aberrations.

The underlying metabolic processes and the influence of environmental factors such as temperature on the activity of the virus are also considered.

743. 633.73:575(92.2)
Malangsche Landbouw Vereeniging. Notulen van de algemeene vergadering, gehouden op 18 November 1933 in de aula van het Proefstation Midden– en Oost–Java te Malang. **(Malang Agricultural Association. Minutes of the general meeting on 18th November, 1933 in the Middle and East Java Experiment Station at Malang.)**
Bergcultures 1933 : **7** : 1391–99.

At Soember Asin no *robusta* varieties have been found to give as good results from selfing as from crossing. The highest set obtained from selfing was about 10 per cent while from crossing the same numbers 80 per cent or more might be reached. The experiment is being tried of backcrossing the *arabica Laurentii* hybrid (Arla I), which apparently sets fruit well on selfing, with some good *robusta* numbers, with a view to finding some *robusta*-type offspring amenable to selfing. Also some Bangelan numbers, particularly Bgn. 209, are better than other *robusta* forms. Last year (1932/33) artificial selfing gave a set of 93 per cent ; this year success to date is hopeful. Further both Quillou Bgn. 121 and *robusta* Bgn. 124·01 have set fruit and yielded well in large monoclone blocks. Also the provisional results of artificial selfing of those numbers are favourable.

As regards weather conditions, some Quillou forms do not open in the rain, but pollen is nevertheless found on the stigmas of flowers, and microscopic examination shews pollen grains present in the stigma. Flowers in this condition, moreover, do set fruit.
Knowledge about stocks has increased greatly of recent years ; *robusta* Bgn. 124·01 and S.A. 109 are useful and have been proved as stocks ; also Quillou Bgn. 121 and Canephora Madagascar 3 Bgn. produce good stocks. As to scions, of the large number of mother trees examined, only some ten, or at most twenty, can be called proved.
The yield of large monoclone blocks has proved unsatisfactory, it is noteworthy that some numbers do not combine well and some are poor pollen producers. Conversely some combinations of grafts planted in such blocks may be expected to give good results. In mixing clones it should be appreciated that so far knowledge of mutually compatible clones is confined to their capacity to produce fruit on crossing ; experiments on clone mixtures are to come. At Bangelan a medley of clones made from surplus grafts of certain numbers has been in yield for 2 years and has given twice as high a yield as seedlings of the same age. The new seed gardens, planted with mixed clones, have also yielded well.
Grafts may safely be employed to improve seedling plantations, provided proved clones are used. Such conditions are naturally favourable to cross-pollination of grafts. F. B.

744. 633.74:575.42(92.2)
633.74:581.162.3
HAAN, J. T. de
Korte gegevens betreffende de cacao-cultuur. (**Brief observations on the cultivation of cacao.**)
Arch. Koffiec. Ned.-Ind. 1933 : 7 : pp. 74.

Under this somewhat modest title the author presents a useful summary of data derived from his own observations and the practical experience of various planters. The remarks on seed and plant selection are of special interest.
Seed should be selected from mother trees of which yield records have been taken for a number of years. It is generally recommended that light coloured seeds only should be sown. The nuts should be well shaped and about 25–30 well developed seeds from the middle of the nut should be chosen.
The morphological characteristics of the varieties of cacao in cultivation in Java which are of 3 types, *viz.*, the Criollo type, the Forastero type and hybrid types are defined.
The aims and the general methods of the work of selection are enumerated and details are given of the criteria to be adopted in selecting mother trees and nuts for superior quality and quantity. Methods are outlined for the establishment of test plantations in which seedlings as well as grafts from various mother trees are raised and also for the formation of plantations consisting of numerous characteristic types of the cacao varieties which can be used either for purposes of comparison *inter se* or later on as a source of specimens for selection tests. Information is given on sexual reproduction and the biology of flowering including the time of opening of the flower and the processes of natural and artificial pollination, crossing and self-fertilization. Various methods of vegetative reproduction are also described.

AROMATIC PLANTS, SPICES, ETC. 633.81/4

745. 633.825:576.312.35
633.825:576.354.4:581.162.5
TAKENAKA, Y.
(Further reports of the cytological investigations on the sterile plants.)
J. Chosen Nat. Hist. Soc. 1932 : 13 : Pp. 2. (Japanese with English summary.)

The somatic chromosome numbers of *Zingiber Mioga* and *Z. officinalis* are 55 and 23 respectively. In the former plant chromosome behaviour during the reduction division is very irregular in the heterotypic metaphase ; the chromosome number exceeds 11 and pentavalents are always present. The sterility of *Z. Mioga* which is regarded as an autopentaploid with a basic number of 11 is attributed to these irregularities.

OIL PLANTS 633.85

746. *Ermakov, A. I. 633.85:578.081
(**A new rapid method of determining the oil in a part of a seed.**)
Bull. Appl. Bot. Leningrad 1933 : Ser A (7) : 61–68.
A description of the method and special apparatus for the determination of the amount of oil in a seed or part of a seed.

MEDICINAL PLANTS 633.88

747. Baker, M. F. 633.88.11.871:581.43
A "strangling" eucalyptus.
J. Hered. 1933 : **24** : 403–04.
A unique instance of a teratological "aerial root" is described in *Eucalyptus robusta* which developed eighteen feet from the ground and broke through the bark ultimately joining with parts of the trunk at the base of the tree.

RUBBER PLANTS 633.9

748. Vollema, J. S. 633.912–1.541(92.1+92.2)
Wat zijn onze laatste inzichten over oculaties als plantmateriaal? (**What are our latest views regarding buddings as planting material?**)
Bergcultures 1933 : **7** : 424–33.
The most recent information about Hevea clones in Java and Sumatra is considered mainly from the practical standpoint.
Particular attention is directed to the close general agreement between the yields from relatively large areas, of bud grafts tapped on a commercial scale with the figures recorded from small scale test tappings.
In brief, it is concluded that complete reliance can now be placed in bud grafts as planting material, as shewn by the trebling—and in some cases quadrupling—of the yield which may be expected from budded clearings as compared with estates planted with material from unselected seed.

FRUIT TREES 634.

749. Angeli, G. de 634–1.541.11:575
Il problema del soggetto dal punto di vista genetico. (**The problem of the stock from the genetical point of view.**)
Ital. Agric. 1934 : **71** : 59–72.
It is now well known that the stock exerts a considerable influence on the scion. At the same time the stocks now in commercial use are either raised from seed and represent a very varied collection of types or if propagated by cuttings no attempt is made to select a parent tree, but cuttings from a number of trees are used.
If cuttings are used the mother tree should be carefully selected with regard to its influence on the scion, but selection may be still more profitably employed on seedling stocks, from which stocks may be selected suitable for all conditions.
It would be desirable if an international scheme of classification of stocks could be drawn up to standardize their production.

750. Veh, R. von 634.1:581.162.5
Wie kann und soll beim Kernobst eine Blüte auf ihre Neigung zur Fruchtbildung hin experimentell geprüft werden? (**How can and should a pome fruit blossom be tested for its tendency to fruit formation?**)
Züchter 1933 : **5** : 241–43.
An experiment based on the author's suggested method of ascertaining the tendency to fruit setting in pome fruits by using counted pollen grains to determine the conditions of polarity

* A translation of this paper is on file at the Bureau.

and correlation in the flowers on a shoot system having failed, a new method of attack based on the following line of enquiry was evolved. In order to determine (1) whether the number of fertilized ovules is related to the position of the flower in the particular flower system ; (2) how far the blossoms exert a mutual influence on each other ; (3) how far the effect of the pollen from various pollen parent varieties differs, it was obviously necessary to be able to determine the number of ovules to be fertilized.
In the author's opinion, owing to the true apocarpous nature of the fruit of the *Pomoideae*, in spite of its apparent coencarpous character, it is possible by removing 4 stigmata from blossoms of the first, second and third order, etc., before pollination, to ascertain for each of these flower categories the minimum number of fertilized ovules which form fruits.
The technique is described and, if utilized for each variety of pome fruit, should, it is claimed, elucidate the three basic problems enumerated above.

751. TONTICI, G. 634.1/8–1.521.6:575.42
Selectiunea viţelor şi pomilor ca mijloc de combatere a bolilor criptogamice. **(The selection of vines and fruit trees as a means of controlling fungus diseases.)**
Viaţa Agric. 1933 : **24** : 490–94.
The selection and breeding of resistant varieties provides the best means for the control of these diseases.

752. RUDLOFF, E. F. 634.1/7:575
Die Edelobstzüchtung. **(Fine fruit breeding.)**
Mitt. deuts. LandwGes. 1933 : **48** : 471–73.
To improve the fruit of Germany it is necessary to do away with a number of worthless sorts and to breed new and improved varieties. Varieties resistant to unfavourable weather conditions and to disease are especially desirable and a number of other characters in which improvement is needed are mentioned.
The difficulties in breeding pome and stone fruits are their hybrid nature and their self-sterility. The methods for breeding and selection are briefly described.

753. GUSTAVO, A. de 634.1/7:575.42
Selezione sistematica dei fruttiferi. **(Systematic selection of fruit trees.)**
Agric. Razionale 1933 : **5** : 228–32.
Notes on the problem of improving the quality of the fruit grown in Italy and on methods for the selection of standard types.

754. CONSTANTINESCU, E. 634.1/2:581.162.5
Sterilitatea pomilor fructiferi. **(The sterility of fruit trees.)**
Viaţa Agric. 1933 : **24** : 183–87.
A brief and general account of the intersterility of fruit trees and in particular of the work of the Institut für Pflanzenbau und Pflanzenzüchtung at Halle.

755. SHAMEL, A. D., POMEROY, C. S. and BREGGER, J. T. 634.11:575.252
Apple bud variations.
Better Fruit 1933 : **28** (3) : 6, 12, (4) : 3–4.
The systematic collection of information on bud variation and selection in citrus fruits which was begun 23 years ago by the senior author was subsequently extended to include other fruits and by November 1932, 321 bud variations in apples, 67 in pears, 114 in peaches, 14 in plums and prunes, 30 in cherries, 7 in apricots, 41 in grapes, 4 in currants, 11 in raspberries and 4 in gooseberries had been recorded from field studies of both the parent and progeny plants or from correspondence and reports where first hand observations were impossible.
The object of the present investigation was first to determine the frequency of occurrence and the characteristics of bud variation in apple varieties, secondly to collect information on their origin from any reliable sources and thirdly to obtain data as a basis for comparing the

relative commercial values of the apple bud variations of each variety and also the yields from the bud sports and the parent forms.
The number of striking variations in each variety of each class which have been recorded prior to November 1st, 1932 is shewn in a table which thus gives some indication of the frequency of sports as observed in the present investigations. Of the total number of bud variations tabulated, 263 relate to fruit colour, 26 to fruit size, 23 to fruit shape, 3 to season of maturity of fruit, 3 to time of tree production, 1 to seediness and 2 to foliage characters.
A study of a number of progeny trees of the Starking, Richared and other commercial colour variations, has shewn that the sports are inherently stable and the same probably applies to the fruit characteristics studied in a few of these progeny trees. The necessity is stressed for adequate experimental progeny tests and also for commercial progeny orchard tests to determine the value of apparently superior strains under the conditions under which they are ultimately to be grown. Suggestions are offered for carrying out these two forms of test and for the best means of searching for and identifying useful sports, the performance of which should be noted for two consecutive seasons before experimental progeny propagation is undertaken to test inherent stability.
Systematic bud selection is now being regularly used as a means of improving apple varieties. New strains should only be put on the market if they have proved definitely superior to established forms from cultural and commercial standpoints. The standardization of strains should be based on the selection of commercial budwood from only those trees in progeny orchards that yield uniformly superior crops both as regards quality and quantity of fruit.

756. Eseltine, G. P. van 634.12(74.7)
Notes on the species of apples. II. The Japanese flowering crabapples of the *Sieboldii* group and their hybrids.
Tech. Bull. N.Y. Agric. Expt. Sta., 1933 : No. 214 : Pp. 21.
The descriptions and distinctive characteristics of the known forms of the species and hybrids of *Malus*, section *Sorbomalus*, subsection *Sieboldianae* are given with drawings of dissected flowers and references to the relevant literature. The species cross readily *inter se* and with the *Eumalus* types.

757. Schanderl, H. 634.13:581.162.5
Die Befruchtungsverhältnisse unserer Birnensorten. (Sammelreferat.) **[Fertilization of our varieties of pears. (General survey of literature.)]**
Züchter 1934 : **6** : 6–12.
The fundamental importance of realizing that fertility of varieties of fruit can only be conclusively determined by the results of pollination experiments on the tree is made clear. Moreover, in estimating self-fertility full allowance must be made for the fruit set as a consequence, not of fertilization, but of parthenocarpy and this applies specially to pears for their marked tendency to this form of reproduction may be of economic importance as, for example, in the case of the pears used for perry.
A warning is given regarding certain inaccurate and misleading uses of the term " self-fruitful " by English writers and allied terms as used by American and Swedish investigators and instances are cited of the false deductions to which failure to distinguish carefully between self-fertilization and parthenocarpy may lead.
In dessert pears the tendency mentioned can be genetically fixed in individual varieties though environmental factors and specially excess of carbohydrates also play their part as causal factors. In many cases, however, parthenocarpic fruits are abnormal and unsatisfactory in many respects. Cross-pollination is therefore a necessity for the fruit grower.
From most of the investigations on self-pollination of pears it is clear that the majority of our pear varieties are self-sterile.
The importance in breeding of pollen formation and pollen germinating capacity is pointed out and exemplified by a table of varieties grouped as good and bad pollen producers. Cytological

studies have demonstrated that all triploids (3n = 51) so far examined form bad pollen owing to irregularities in chromosome number and pairing. Purely physiological causes of incompatability also exist however. Instances of true intersterility groups recently identified in pears are given. The incompatability has been tentatively explained as possibly due to a selective action of the stylar secretions on the pollen tubes.
A bibliography of 29 references completes the paper.

758. 634.21
COE, F. M. 634.23
Chinese apricot and Black Orb cherry identified as old varieties.
Better Fruit 1933 : **27** : 12, 6.
The Chinese and Jones apricots of Utah, U.S.A., have been identified with the Large Early Montagamet and the Black Orb cherry with the Schmidt Bigarreau variety.

759. CASELLA, D. 634.22
Il *Prunus Cocumilia* Tenore. (***Prunus Cocumilia* Tenore.**)
Ann. Staz. Frutt. Agrum. Acireale 1933 : (N.S.) **1** : 1–8.
Particulars are given of the history, distribution and general characteristics and botanical description and uses of the plum *Prunus Cocumilia* Tenore which is indigenous to southern Italy. Its tendency to fail to germinate if taken from the region which is its natural habitat was confirmed by experiments made by the author, and various possible causes of this defect are considered.
Among other good points *P. Cocumilia* is resistant to cold and to gummosis and the author intends to investigate its possible value for the production of similarly resistant hybrids and its use as a stock. Experiments are also to be carried out on the propagation of this species in seed beds, on the improvement of the quality of its fruit and on its acclimatization in cooler climates.

760. RACAH, V. 634.22 Florenzia
La nuova susina " Florenzia." (**A new variety of plum, " Florenzia."**)
Ital. Agric. 1932 : **10.**
The remarkable earliness of this new important variety is emphasized and suitable stocks on which it may be grafted are also mentioned.
The " Florenzia " which originated as a seedling is a good self-pollinator and is thought to be derived from Santa-rosa which arose from a Mirabolane cross.

761. KRÜMMEL, H. 634.23:581.162.5
Untersuchungen über die Befruchtungsverhältnisse bei Kirschen III. (**Investigations on the fertility relations in cherries III.**)
Kühn-Archiv 1933 : **38** : 202–22.
Further pollination experiments with sweet cherries (see " Plant Breeding Abstracts " Vol. II Abst. 691) were made in three places in the neighbourhood of Halle to increase the knowledge of their intersterility and pollination relations.
The results of Crane and Lawrence on the behaviour of inter-sterile groups was confirmed. All the 23 varieties hitherto tested belonged to four inter-sterile groups. All the new varieties tested were self-sterile.
The characteristics of the stone are found to be of great value for the identification of varieties.

762. KOBEL, F. and STEINEGGER, P. 634.23:581.162.5(49.4)
Die Befruchtungsverhältnisse schweizerischer Kirschensorten. (**The fertility relations of Swiss cherry varieties.**)
Landw. Jb. Schweiz 1933 : **74** : 973–1018.
Seventy-five different varieties of cherries were investigated and descriptions of the varieties and their fertility relations were given. All the sweet cherries were self-sterile and among them six intersterile groups of 2–7 varieties were found.

763. BRANSCHEIDT, P. 634.25:581.162.5
Beitrag zur Frage der Sortenbeschreibung und der Fertilitätsverhältnisse beim Pfirsich. (**On the question of varietal descriptions and fertility relationships in the peach.**)
Gartenbauwiss. 1933 : 8 : 45-76.

In addition to the main enquiry on fertility in the peach a large number of data was collected on characters such as flower shape and colour, relative number of blossoms on a tree, time of flowering as compared with unfolding of the leaves and habit in different definite growth types, all with a view to possible genetic studies in the future. The value of these and other characteristics as varietal characters is discussed.

In a number of varieties the flower did not open until the pollen was ripe so that pollination had taken place before the flower opened.

In contrast to Kobel's findings no relation was found between germination capacity of the pollen and the time of opening of the flower.

Pollen germination tests and cytological examination shewed with few exceptions moderately good results and even where the germination percentage was low it is stated "that under favourable conditions only one spore is required for the fertilization of the ovule", whereas in pome fruits at least 10 spores are required. J. H. Hale and June Elberta produced very little and sterile pollen owing to chromosomal disturbances though the normal haploid number 8 for *Prunus persiaca* (*sic*) was found.

In the author's opinion many so-called varieties of peaches are genetically impure—a point of importance in breeding work.

The results recorded for the Elberta variety have already been reviewed (see " Plant Breeding Abstracts," Vol. IV, Abst. 225).

The effects of the conditions of nutrition on pollen germination and on fruit formation were observed. Fruits situated at the tip of the branch develop either badly or not at all, especially in branches without leaves for the formation of assimilation products.

In crossing experiments it is advisable at the time of emasculation to remove all blossoms except two at most, no special selection of the flowers to be left on the branch is necessary.

The results obtained in 1931 and 1932 from 10,375 crosses and 8,413 mainly natural selfings are tabulated. The self-sterility of the varieties J. H. Hale and June Elberta was confirmed ; all other varieties proved fully self-fertile.

Where selfing was done by artificial pollination it appeared that complete emasculation was not so injurious in the peach as it was in pome fruits according to the author's findings. Natural selfing gave considerably higher yields than artificial self-pollination. Definite intersterility was not found, and the absence of ripe fruit in spite of a very good set of seed in various crosses is explained on other grounds.

The transference of peach pollen by the wind was established as a fact.

764. 634.3–1.541.11
YEDIDYAH, S. 634.3:581.163
The citrus root-stock problem in Palestine.
Hadar 1933 : 6 : 258–62.

The importance of citrus stock selection in the nursery for vigour and conformity to type is emphasized.

Attention has recently been turned to hybrids as stocks for citrus trees and the possibilities of crosses which are highly apogamic are now being seriously considered in Palestine and it is hoped that experiments with hybrids may be started.

In 1933 hand pollination was used to obtain new root stocks and to study among other points of interest the resistance of the sweet-lime to the " new disease " or gummosis.

Cross-pollination may also reveal the percentage of apogamy of the lime and sour orange, though allowance must be made for the effects of cross fertilization which is believed to reduce the percentage of apogamy in the sweet-lime or sour orange. Hence where the maximum degree of apogamy is desired, the trees should be grown apart from other citrus varieties.

The rough lemon and the sour lime are also apogamic, though less so at the Mikveh Israel Agricultural College, owing probably to cross-pollination by other varieties.

765. 634.3–1.541.11:575
OPPENHEIM, J. D. and RAPOPORT, Z. 634.337:575.2
The amelioration of citrus rootstocks. I. The sweet lime.
Gartenbauwiss. 1933 : **7** : 142–53.

With the object of improving lime rootstocks for the Jaffa orange a study of variability in the lime was made in the expectation of being able to isolate parent trees from which a uniform progeny could be obtained.

The results appeared to shew that for quantitative characters such as height and diameter of trunk the pedigree of a tree exercises no effect on the progeny. For morphological characters only very slight variability has so far been noted, the morphological variants constituting an average of 1 per cent to 2·7 per cent of the total number of plants.

In the lime, variability, " or more properly perhaps modificability " (*sic*), expresses itself mainly in quantitative differences.

In conclusion the author suggests that the almost complete homogeneity of the lime may indicate that in this species nucellar-embryony approaches 100 per cent— a hypothesis which must be examined by future cytological work.

766. CASELLA, D. 634.3–2.3:575.252
Un tumore prodotto da *Bacterium tumefaciens* Smith e Town su arancia ovale e la selezione gemmaria. (**A tumour produced by *Bacterium tumefaciens* Smith and Town in the oval orange and bud selection.**)
Ann. Staz. Frutt. Agrum. Acireale. 1933 : (N.S.) **1** : 43–45.

A note on what the author believes to be the first record of a tumour in the orange with the exception of the instance stated to be wrongly interpreted by Shamel as a bud variation in his paper on the Washington Navel orange (see " Plant Breeding Abstracts," Vol. IV, Abst. 242).

767. ROBINSON, T. R. 634.323:576.16
The origin of the Marsh seedless grapefruit.
J. Hered. 1933 : **24** : 437–39.

The conflicting, though hitherto accepted, evidence on the origin of the Marsh seedless grapefruit has been investigated and weighed and the author concludes that the new variety arose not as a bud sport from a broken off root shoot of an ordinary seedling grape-fruit producing only seeded fruits, but as a seedling tree from which buds for propagation were first taken when it was 30 years old or more. Other seedless forms are described including a supposed grapefruit x tangerine hybrid (*i.e.*, a tangelo) and it is suggested that the original Marsh seedless may have originated through some similar form of foreign pollination of an ordinary grapefruit. A mutation of the Marsh is also mentioned.

768. CASELLA, D. 634.323:581.163
Un caso di neocarpia nel pompelmo (*Citrus paradisi* Macf.). (**A case of " neocarpy " in the pomelo *Citrus paradisi* Macf.**)
Ann. Staz. Frutt. Agrum. Acireale 1933 : (N.S.) **1** : 77–84.

A case in *Citrus paradisi* Macf. of " neocarpy " or the flowering and fruiting of plants while still immature.

The phenomenon which may occur in young plants of the arboreous species before lignification takes place and shortly after germination is described in *Citrus paradisi*. The cause of the phenomenon is unknown but various possible contributory factors are discussed together with the relevant literature.

769. CASELLA, D. 634.334:575.252
L'apiatura del limone e la selezione gemmaria. (**The " apiatura " of the lemon and bud selection.**)
Ann. Staz. Frutt. Agrum. Acireale 1933 : (N.S.) **1** : 47–49.

It is quite frequently observed in lemons that on some branches the surface of the fruit instead of being smooth is ridged or wrinkled or shews lines of light yellow and white. The leaves of such branches may be normal or shew marked variations.

Such abnormalities named " apiatura " are attributed by the growers to the effect of citron pollen carried by bees [Italian : api]. Shamel and his co-workers have described similar variations in the fruit which they consider to be bud sports but which in the author's opinion are typical examples of the effects of virus disease.

770. 634.441
Note sur les manguiers. (**Notes on mangoes.**)
Bull. Écon. Indochine 1933 : **36** : 805–16.
A considerable quantity of data has been collected on the forms and varieties of the mango about the nomenclature of which so much confusion has hitherto prevailed. The botanical description of the tree is also given, with notes on the cultivation, methods of propagation, yield and chemical composition of the fruit and pathogenic organisms including insect pests.

771. CHEVALIER, A. 634.58
Monographie de l'arachide. (**Monograph on the peanut.**)
Rev. Bot. Appl. Agric. Trop. 1933 : **13** : 689–789.
This paper, which forms the first part of a comprehensive work on the peanut, deals with the position of *Arachis* in systematic classification and also with its economic and agronomic value. An historical review of the introduction of this plant into various countries and descriptions of its uses is also given.
A full systematic study of the genus *Arachis* is made and includes an analytical key for species and descriptions of the species with data on their geographical distribution. The possibility of the discovery of new races of peanuts in South America is touched upon.
The descriptions given of characters for distinguishing between races and varieties of peanuts and of distinctive morphological characters of the pod and the grain should prove useful for selection work.
The principal varieties known at the present time are considered and briefly compared with the standard types of U.S.A. and other countries, on the basis of the relation of nut volume to weight.
Several lists of vernacular names are included in the various sections.
Other Leguminosae with subterranean fruits are also described.

772. HUSTED, L. 634.58:576.312.34/5
Cytological studies on the peanut, *Arachis*. I. Chromosome number and morphology.
Cytologia 1933 : **5** : 109–17.
Sixteen strains of *Arachis hypogaea*, both bunch and runner varieties, one of *A. nambyquarae* and one of *A. Rasteiro* (?), were cytologically examined and the somatic chromosome number in each case was 40. The haploid chromosome number of one bunch and two runner varieties of *A. hypogaea* was found to be 20. The attachment constriction of the chromosomes was approximately median and secondary constrictions were often observed ; as many as eight pairs with such constrictions occurring in *A. nambyquarae* and six in a Spanish type variety of *A. hypogaea*.
The chromosomes of a complement could be, to a certain extent, separated into seven size classes, one pair being markedly smaller than the rest.
Irregular chromosome association and " secondary association " were observed and further investigations are in progress.
The relationships and origin of the types of cultivated peanut are discussed and at present there is no evidence to support Waldron's hypothesis of their dual origin.

773. JUMELLE, H. 634.6(69.1)
Les palmiers de Madagascar. (**The palms of Madagascar.**)
C.R. Acad. Sci. Paris 1933 : **197** : p. 437.
The known species number about 110 comprised in 18 genera of which 12 belong exclusively to Madagascar.

774. MACEDA, F. S. 634.61:581.47:581.14
A study of coconut seedlings in relation to shape of the nuts.
Philipp. Agric. 1933 : **22** : 430–41.
In this investigation of the relation between certain seedling characters and the shape of the parent coconut, 1,000 round or oblong Laguna nuts and 902 seedlings were examined.
No difference was found in percentage of germination between oblong and round nuts, but round nuts tended to germinate earlier than the oblong ones and produced the heavier seedlings and with a greater number of roots and leaves. Neither the length of the leaves nor of the roots of the seedlings were dependent on the shape of the parent nuts.

775. CASELLA, D. 634.63–1.541.11
Primo contributo su alcuni portainnesti dell'olivo. **(Preliminary contribution on some stocks for the olive.)**
Ann. Staz. Frutt. Agrum. Acireale 1933 : (N.S.) **1** : 51–56.
Various trees and bushes were tested for their use as stocks for the olive, for grafting, besides making genetical studies more feasible, might help considerably to improve the plant and make it more resistant.
Successful grafts were made with *Ligustrum vulgare* L., *L. ovalifolium*, *Syringa vulgaris* and *Fontanesia phillyraeoides*.

776. BALLY, W. 634.651
Papaya and papain.
Int. Rev. Agric. Rome 1933 : **24** : 454–67.
On the origin, systematic classification, distribution of sexes, cultivated varieties and cultivation of the papaya and the preparation and use of papain. References to key papers containing bibliographies of earlier literature are given.

777. DARROW, G. M., WALDO, G. F. and SCHUSTER, C. E. 634.75:575
Twelve years of strawberry breeding. A summary of the strawberry breeding work of the United States Department of Agriculture.
J. Hered. 1933 : **24** : 391–402.
The general methods and the technique employed in strawberry breeding since 1920 at Maryland Station are described, discussion of the actual results being reserved for a future article.
The aims were the development of a berry of high dessert quality and suitable to the eastern states, of satisfactory canning varieties and varieties suitable for preservation by refrigeration.
A full list of the characters on which selection was based is given.
Certain crosses, especially those with *Fragaria chiloensis*, appear to be relatively resistant to root rot (*Rhizoctonia*), while selections from other crosses shew inheritance of resistance and susceptibility to mildew. Records have been made of leaf spot infection in several thousand seedlings of different crosses but do not yet allow of definite conclusions. In a comparison of over 1,000 different selections and varieties some 20–30 seemed more resistant than the Blakemore to aphids, including 16 selections bred at Maryland Station and 2 at Oregon. Bud weevil resistance too has been found in certain varieties and it seems likely that it may be possible to breed for this character in conjunction with more pollen in the flowers. Varieties resistant to high temperatures have also been bred.

778. GUBA, E. F. 634.75–2.191:575
" Suspected mosaic " of the strawberry.
Phytopathology 1933 : **23** : 654–61.
In this attempt to determine the nature of " Suspected mosaic " or gold leaf in the strawberry it is stated that seed from affected plants produces both chlorotic and healthy seedlings, the former shewing a marked tendency to stunting and their ultimate death being associated with

an almost complete absence of chlorophyll. The latter feature is typical of genetic chloroses as opposed to the chlorophyll degeneration accompanying virus diseases.
A recessive genetic factor dependent on certain environmental conditions for its expression is assumed to be responsible for the disease.

779. Wilcox, R. B. and Beckwith, C. S. 634.76–2.8–1.521.6:578.08
A factor in the varietal resistance of cranberries to the false-blossom disease.
J. Agric. Res. 1933 : **47** : 583–90.
Varietal resistance to false-blossom is almost certain to play a large part in the development of new commercial forms.
The results of this investigation seemed to indicate that the apparent resistance of certain varieties of cranberry to false-blossom disease is in part due to their unattractiveness to the blunt-nosed leaf hopper. A rapid and reliable test of this type of varietal resistance was evolved.
On the basis of field observations for several years and observations of insects in cages where they had a free choice of food plants, the following descending order of susceptibility to false blossom was arrived at : Howes and Centennial, Champion, Early Black and McFarlin. It is also possible that McFarlin or other varieties may ultimately be found to possess in addition some degree of actual resistance to the false-blossom virus.

780. Collins, J. L. 634.774:575.115
The genotype of the Cayenne pineapple.
Proc. Hawaiian Acad. Sci. 1933 : Spec. Pub. No. 21 : pp. 1.
On selfing, the Cayenne pineapple is seen to carry numerous heterozygous recessive genes. Its heterozygosity may be due to (1) its probable origin as a hybrid seedling and (2) the occurrence in the genotype of additional recessives which have appeared since the variety became a clone. Vegetative reproduction permits the accumulation of recessive mutations and the author believes the Cayenne pineapple today contains many more recessive genes than when the variety was new and furthermore that this heterozygosity will continue to increase. Hence with the passage of time an increasing number of mutant characters may reasonably be expected to appear in Cayenne populations.

781. Holmes, L. E. 634.774:581.192:575.11
Studies in the morphology and biochemistry of the pineapple. II. Reserves in the seeds of two genera of the *Bromeliaceae* and of various pineapple hybrids.
New Phytol. 1933 : **32** : 382–92.
A biochemical study was undertaken of the composition of varieties of *Ananas sativus* and *Bromelia pinguens*, the varieties representing both genera being mainly hybrids.
Both groups shewed a close similarity in the type and the quantities of the compounds stored. The *Ananas* varieties shewed a considerable range of variation in carbohydrate content. The two forms which contained the highest percentage of carbohydrate were hybrids obviously closely related, *viz.*, No. 5 from a Cayenne x Ruby cross and No. 4 from a similar cross back-crossed to the parent Cayenne. It therefore seems possible that the parent " Ruby " possibly contains a factor for high carbohydrate content—higher than the " Cayenne " variety—and that while in the simple cross the Ruby character dominates, when there is a " double dose " of Cayenne the percentage tends to be lowered.
Two other hybrids, Nos. 8 and 9, are the first and second generations respectively of the cross Cayenne x Smooth Guatamala. The reducing sugar content in the F_1 seed is exceptionally high and in the F_2 lower, but in both cases it is higher than in the Cayenne parent. From this it is inferred that possibly " Guatamala " may have a factor for a much higher reducing sugar content than " Cayenne," and this factor is dominant in the F_1 generation, but in the F_2, where some of the seed will not contain " Guatamala," the percentage of these sugars is reduced by over 25 per cent.

The differences found in the composition of the different seeds are for the most part, regarded as being more likely to be due to heredity than environment.
The seeds of both genera, *Ananas* and *Bromelia*, were remarkable in their extremely high content of reducing sugar and shewed a close mutual resemblance which is all the more interesting since taxonomic relationship between seeds is more usually displayed in qualitative than in quantitative biochemical phenomena.

782. STUMMER, A. and FRIMMEL, F. 634.835(43.72)
Bericht über die Rebenzüchtungsarbeiten des Jahres 1933. Deutsches Gebiet von Mähren. (**Report on vine breeding in 1933. German area of Moravia.**)
Verlautb. deuts. Sekt. mähr. Landeskulturrat. 1933 : **34/10** 169-73.
Selfed vines come into bearing earlier than hybrids. The year 1933 was very unfavourable for the estimation of the grape characters, though, as an average year for *Peronospora*, it was suitable for susceptibility tests. It is possible that the occurrence of phylloxera for the first time this year in the seedling plots will throw light upon the susceptibility of the American crosses.
A number of rows of the vineyard clones at Rausenbruck were tested for yield of grapes and quality of juice. Measurements of the stems of the bunches shewed that long stem was dominant to short ; monofactorial inheritance is regarded as likely. The report also contains information on heterosis experiments, mutations (especially those affecting grape colour), variegation (*e.g.*, progeny from markedly chlorophyll deficient forms shew a pronounced tendency to variation), dwarfing (there are numerous intergrades between dwarf and normally developed seedlings). " Curl disease," virus diseases and delayed germination need scarcely be considered in elucidating the phenomenon of dwarfing ; probably in the progeny of heterozygous parents *inter alia* seedlings with various growth defects segregate out. Some tables are appended. A. B.

783. 634.835.09
Best grapes among thousands tested.
Horticulture 1934 : **12** : p. 20.
From 20,000 vine seedlings obtained from numerous crosses made at the New York State Experiment Station, Geneva, during the past 25 years, the following varieties are now recommended in the catalogue of new fruits issued by the New York Fruit Testing Station :—White types, Brocton, Golden Muscat, Ontario, Portland and Seneca ; red types, Dunkirk, Hanover, Keuka and Urbana ; and black types, Fredonia, Sheridan, Watkins and Wayne. Fredonia is noted for earliness combined with quality, Golden Muscat for appearance and flavour while for the latter quality Keuka is stated to be unsurpassed.

784. MOOG, H. 634.835.09
Beiträge zur Ampelographie. (III. Mitteilung.) (**Contributions on ampelography. III.**)
Gartenbauwiss. 1933 : **8** : 1–44.
A continuation of the previous article (see " Plant Breeding Abstracts," Vol. III, Abst. 516). Some information is given on the identity and origin of various vines and their probable constitution and full descriptions of 34 varieties complete the account.

785. SEYVE, B. and SEYVE, J. 634.835.09–1.541.1
Plantation d'hybrides. (**Planting of hybrids.**)
Rev. Vitic. Paris 1934 : **80** : No. 2066 : 77–78 : No. 2067 : 94–95.
Artificial hybridization is advocated for the production of vine plants. From the progeny are selected, first the most vigorous and then the most fertile and resistant to disease. It is advisable to test the plants in the locality in which they are to be grown.
A list is given with brief descriptions of the hybrids obtained and recommended by the author.

786. Rives, M. L. 634.835.094(44)
Conférence-dégustation sur les hybrides producteurs directs. (**A Conference on direct producers, followed by the tasting of samples.**)
Sélectionneur 1933 : **2** : Fasc. spéc. 58–63.
The well known qualities, both positive and negative, of direct producers is discussed with reference to viticulture in France. The success obtained by the writer with superior hybrids grafted on 22 different stocks is reported, special emphasis being laid on the suitability of the progeny of the Berlandieri vine types for the grafting of hybrids.
A number of collections of vines obtained by hybridization and from various nurseries are described with reference to their quality, economic value and their resistance to phylloxera and disease.

787. Casella, D. 634.844.1–1.535
La propagazione della *Vitis Berlandieri* per talea. (**Propagation of *Vitis Berlandieri* by cuttings.**)
Ann. Staz. Frutt. Agrom. Acireale 1933 : (N.S.) **1** : 9–19.
In spite of the numerous good points of the *Berlandieri* vine one defect which has hitherto proved a serious obstacle to its use as a stock is the difficulty of obtaining cuttings.
Previous research suggested that the absence or inadequate supply of oxidizing enzymes in the cuttings themselves might result in incomplete or too slow oxidization in the root and thereby cause the death of the young roots and of the cutting. Further experimentation shewed that this basic assumption was correct and a large number of successful cuttings and layerings were carried out. The method recommended is fully described.

FORESTRY 634.9

788. Jimbo, T. 634.97:581.331.2
The diagnoses of the pollen of forest trees. I
Sci. Reps. Tôhoku Imp. Univ. 4th Ser. 1933 : **8** : 287–96.
The diagnostic characters of the pollen of the main forest trees of Japan and also of some other countries were investigated.

789. Wettstein–Westersheim, W. von 634.972.3:575
Die Züchtung von Populus, II. (**The breeding of poplars, II.**)
Züchter 1933 : **5** : 280–81.
The results of crosses beween representatives of the systematic groups, the Trepidae, Albidae, Aegiri, Tacamahacae, Leucoidae. The species used and the F_1 all had 38 chromosomes (2n). Vigour, maternal dominance, dwarfing and degree of heterosis were studied in various combinations.
The author holds that it is possible from the systematic position of a poplar species to predict whether a combination will give the desired characteristics in economically useful form.

790. Woodward, C. H. 634.972.3:575.12
New hybrid poplars for reforestation.
J., N.Y. Bot. Gdn. 1933 : **34** : 268–70.
A summary of Stout and Schreiner's work reviewed in " Plant Breeding Abstracts," Vol. IV, Abst. 268.

791. Winkler, H. and Anton, E. 634.972.6:576.1
Studien über *Betula alba* L. im Anschluss an Morgenthaler und Gunnarsson. (**Studies on *B. alba* L. with reference to the work of Morgenthaler and Gunnarsson.**)
Beitr. Biol. Pfl 1933 : **21** : 256–99.
Morgenthaler and Gunnarssons' systematic classification of *B. alba* L. is subjected to a critical examination and the hybridity of certain forms, regarded as species by Morgenthaler and Gunnarsson, and likewise the species rank of certain so-called hybrids is demonstrated.

792. 634.975:581.44:575.24
SCHRÖTER, C. 634.975:581.143:575.24
Uebersicht über die Mutationen der Fichte nach Wuchs und Rinde. (**Survey of the mutations affecting growth and cortex formation in the spruce.**)
Ber. schweiz. bot. Ges. 1933 : **42** : 762–69.
Illustrations with explanatory notes on a number of mutations affecting growth and cortex formation in a number of dwarf and other forms of the spruce are presented.

VEGETABLES 635

793. 635:581.48
LAUCHE, K. 633.581.48
Über Zwillingsbildungen bei Pflanzen. (**On twinning in plants.**)
Verlautb. deuts. Sekt. mähr. Landeskulturrat. 1933 : **34/10** 144-45.
Twinning was observed by the author in tomatoes, lettuce, onions, kohlrabi, spinach and carrots. The progeny of the twin tomatoes gave only single plants. In the case in question twinning in spinach was dizygotic. A. B.

794. 635.127:576.356.52:581.162.51
MORINAGA, T. and FUKUSHIMA, E. 633.42:576.356.52:581.162.51
Karyological studies on a spontaneous haploid mutant of *Brassica Napella*.
Cytologia **1933** : **4** : 457–60.
A record stated to be the first known case of haploidy in *Brassica*.
A number of highly sterile individuals of *Brassica Napella* (= *B. Napus*) which on being bred produced no sterile progeny proved to be haploids.
The haploid mutant which is declared to be of comparatively common occurrence in rape fields is described.
Cytological examination shewed 19 to be the gametic chromosome number in root tips. In the metaphase of the heterotypic division from 0–6 or 7 stretched bivalents were found, a condition which is possibly due to a weak affinity between the chromosomes of the two different genoms *a* and *c* which compose the composite genom of *B. Napella*. Fairly often the heterotypic division is suppressed and one large nucleus like that at interphase results and later develops a single homotypic spindle with the total number of chromosomes. The second division is comparatively regular. The pollen grains produced are small and shrunken but some large, perfect grains are always present.
The possibility that the haploid rape which occurs with apparently unusual frequency for a mutation of that type might be a hybrid of two monogenomic species with 9 and 10 chromosomes is rejected on various grounds.

795. WANSCHER, J. H. 635.13:576.312.35
Studies on the chromosomes numbers of the *Umbelliferae*. III.
Bot. Tidsskr. 1933 : **42** : 384–99.
The diploid chromosome number for *Daucus carota* and *D. maximus* is 18. The variation and evolution of chromosome numbers in the *Umbelliferae* and the morphology of the chromosomes are discussed.

796. 635.24:575"793"
The early artichoke in Central France.
Int. Rev. Agric. Rome 1933 : **24** : 523–24.
An early artichoke which flowers in August and can be cropped early in September, about two months ahead of the ordinary varieties, has been introduced into Haute Vienne. The tubers are white and like the winter varieties often difficult to clean. Though they never grow as tall as the latter the weight of the crop per hectare in a normal year is equal to or even higher than that of the ordinary varieties.

797. DANIEL, L. 635.24–1.541:633.854.78:575.31
Sur les variations de l'*Helianthus Dangeardi* à la cinquième génération. (**On the variations of *H. Dangeardi* in the fifth generation.**)
C.R. Acad. Sci. Paris 1932 : **195** : 924–26.
Seed from the F_4 of *H. Dangeardi* which had been grafted on *H. annuus* was sown and produced 11 plants which shewed a number of variations some of which are described.
According to the author some of these plants shewed the inheritance of acquired characters, others the progressive accentuation of characters, the appearance of new characters and monstrosities and the transmission of specific characters of the stock to the scion.
The transmission has taken, in this case, 27 years to shew itself.

798. DANIEL, L. 635.24–1.541:633.854.78:575.31
Sur les curieuses variations des descendants de l'*Helianthus Dangeardi* à la sixième génération. (**On some curious variations of the progeny of *H. Dangeardi* in the sixth generation.**)
C.R. Acad. Sci. Paris 1933 : **197** : 725-27.
A Jerusalem artichoke, grafted on *Helianthus annuus* in 1921, after 26 years of continual experiment set seed which gave the different types, among them *Helianthus Dangeardi*, which inherited many new characters.
It was only in 1932 that seed was again obtained which gave 139 germinations, representing the sixth generation of the grafted *H. Dangeardi*. All the plants were different and the variations are classified as due either to the struggle for life of the grafted plant or to the hereditary transmission to the scion of the characters of the stock.

799. JONES, H. A. and EMSWELLER, S. L. 635.25:575:578.08
Methods of breeding onions.
Hilgardia 1933 : **7** : 625–42.
Onion improvement work begun in 1923 to develop a more uniform strain of Australian Brown has now been expanded to include the production of onions resistant to pink root, mildew and thrips, the selection of non-bolting strains of Sweet Spanish and to the mode of inheritance of scale, flesh and foliage colours and of other characters.
The development of the inflorescence and the flower, method of handling plants for selfing, use of windbreaks, method of increasing seed and the technique adopted in crossing, with examples from actual varietal crosses made, are described in full detail. The harvesting and curing of seed, the growing of seedlings and transplantation are also discussed and an outline of a breeding programme so far regarded as most suitable for the improvement of onion varieties and for obtaining pure stocks concludes the paper.

800. LEVAN, A. 635.26:576.354.46
Cytological studies in *Allium*, V. *Allium macranthum*.
Hereditas 1934 : **18** : 349–59.
The chromosomes of *A. macranthum* can be divided into three distinct size classes, consisting of 6 long, submedially constricted chromosomes (L), 4 medium long, subterminally constricted (M) and 4 short, submedially constricted (S). The ratio of chromosome length is about 1 : 2 : 3, L measuring 8·5μ, M 6·4μ and S 2·8μ.
At meiosis 14 bivalents are formed ; quadrivalents have never been observed. Clear cases of interlocking were seen at pachytene.
The S bivalents had 1–2 chiasmata and the L and M chromosomes 2–8. Terminalization was found to proceed at a faster rate in the S chromosomes which agrees with Darlington's electrostatic theory of meiosis. A study of the distribution of the chiasmata shewed that their number was proportional to the length of the chromosome.

801. 635.34–1.547.1:578.081
STAHL, C. 635.35–1.547.1:578.081
Laboratory and field germination of cabbage seed.
C.R. Ass. Int. Essais Semences, Copenhagen, 1933 : No. 1 : 42–56.
The germination of seed from 99 samples of white cabbage seed and 100 samples of cauliflower were tested under field and laboratory conditions.
In both species a high percentage of germination in the laboratory was correlated with rapid field germination.
The percentage of germination in the field was lower for cauliflower than for white cabbage with the same percentage for germination in the laboratory. The various laboratory techniques were investigated to ascertain which gives the best indication of the plant producing capacity of the samples, *i.e.*, the number of plants in the field, and on the whole it is recommended that seeds should be germinated on filter paper, not soil and that the method employed should also allow of the regulation of moisture and temperature thus facilitating the standardization of the technique so that the same sample may be satisfactorily tested by a number of seed testing stations.

802. 635.34–2.484–1.521.6
Cabbage yellows.
Circ. N.J. Agric. Expt. Sta. 1933 : No. 283 : Pp. 2.
A brief list of the most promising yellows resistant varieties is given.

803. ANDERSON, M. E. 635.34–2.484–1.521.6:575
Fusarium **resistance in Winconsin Hollander cabbage.**
J. Agric. Res. 1933 : **47** : 639–61.
The object of this investigation was to compare the nature of the resistance of Winconsin Hollander cabbage to yellows (which is due to *Fusarium conglutinans*), with the resistance displayed by homozygous resistant and homozygous susceptible lines of other varieties. The influence of high and low soil temperature on resistance was also examined.
The evidence indicated that as regards resistance the Winconsin Hollander variety consists of a heterogeneous group of individuals and that its resistance is controlled by modifying cumulative factors different in type and reaction from the single dominant factor controlling resistance in the homozygous resistant lines.
Segregation of factors for resistance occurred in the F_1 and F_2 progenies from self-pollinated Winconsin Hollander plants. Some F_2 progenies exhibited a higher degree of resistance and others a lower degree than did the progenies from which the mother plants were selected.
The resistance of Winconsin Hollander as compared with that of homozygous resistant plants is of intermediate type, and breaks down to a greater or less extent when plants are grown in inoculated soil at constant temperatures of 20–24°C.
The resistance of Winconsin Hollander can be increased by selection in self-pollinated lines but whether a resistance equal to that of homozygous resistant strains could be developed in Winconsin Hollander as a result of the accumulation of modifying factors has still to be determined.
Apparently the age of seedlings had no effect on the disease reaction. The balance between resistance in Winconsin Hollander plants of the same genetic constitution and the virulence of the pathogen in causing disease is considered.

804. NICOLAISEN, W. 635.41:575.125
Dreijährige Versuche über Heterosis bei Spinat. (**Three years' researches on heterosis in spinach.**)
Arch. Pflanzenbau 1934 : **10** : 586–98.
The female plants were found to be never without some hermaphrodite flowers and therefore removal of the male plants did not completely prevent fertilization.
Comparison of the yield of the F_1 with the mother plants shewed that crossing had enormously increased the yield.

Differences in the individual combinations indicate that the capacity for heterosis is a varietal character dependent on genetical factors.
Differences in the yields of the same crosses in different years is attributed to differences in external conditions.
In conclusion it has been demonstrated that heterosis exists in spinach to an extent which might prove of practical value.

805. LESAGE, P. 635.563:575.31"793"
Contribution à l'étude des modifications héréditaires produites dans les plantes par la chaleur. (**Contribution to the study of hereditary modifications produced in plants by heat.**)
C.R. Acad. Sci. Paris 1933 : **197** : 1061–63.
Plants of *Lepidium sativum* were grown (a) some in frames, some out of doors or (b) some in the south (Algiers, Marseilles) or some in the north (Rennes, Rothamsted) and sown in March and in May.
The author found that for (a), given suitable conditions, the plants grown with extra heat were earlier, that after two generations the seed from such plants when sown out of doors gave plants earlier than plants whose parents had not been so treated and that this earliness continued for several generations (see " Plant Breeding Abstracts," Vol. IV, Abst. 511). The results of (b) were similar but the number of generations before earliness was acquired as a heritable character was variable.

806. 635.61/3:575.061.1
633.84:575.061.1
SINNOTT, E. W. and KAISER, S.
Two types of genetic control over the development of shape.
Bull. Torrey Bot. Cl. 1934 : **61** : 1–7.
In pure lines of *Cucurbita* and *Capsicum* the measurements of length and width, plotted logarithmically, for the developmental stages from the earliest observable ovary primordium to the mature fruit were examined. In *Cucurbita* the various shape types were visible in the earliest primordia and the relative dimensional growth rates established at that stage persist essentially unchanged up to maturity. In *Capsicum* the developing ovary is essentially similar in all types studied.
The results indicated that genes for shape may exercise their control differently. In *Cucurbita* they impinge early upon the developmental cycle and set up different levels of relative growth which are thereafter maintained with little modification. In *Capsicum* they apparently impinge at a much later stage and produce their effect through a modification of the growth rate of one dimension relative to that of the other, from its early stages until about the time of fertilization. Soon after anthesis differences in the relative dimensional growth rates appear, subsequently resulting in the shape differences that distinguish the mature fruits.
The stage of development at which the genes for fruit shape produce their visible effect thus differs markedly in these two genera.
The fact that there are such marked differences in the time of visible gene effect, however, suggests that a more detailed analysis of such divergent types may throw some light on the general problem of the relation between genetic constitution and developmental processes.

807. PORTER, D. R. 635.615:575.14
Watermelon breeding.
Hilgardia 1933 : **7** : 585–624.
A consideration of the findings of other workers on inbreeding in the *Curcurbitaceae* is followed by a description of the habit and floral structure of the watermelon, with suggestions for a technique of self-pollination. The experimental material consisted of inbred seed mainly of the Klondike strains.
Three years' observations shewed that inbreeding did not invariably tend to reduce plant vigour and apparently produced greater homozygosity for those factors responsible for growth rate.

The available data also suggest that inbreeding does not necessarily adversely affect the number of fruits per plant nor total yield per plant (as determined by the weight and number of fruits per plant) and may serve to isolate strains of weight and type equal to commercial stocks. Inbreeding for 6 generations with elimination of undesirable shapes was sufficient to fix the desired type.
The seeds of the inbred strains were significantly smaller than in commercial stocks. A number of improved strains are described from the economic standpoint.
Among the conditions influencing the setting of fruit after artificial self-pollination, were air temperature and humidity, hour of pollination, size of the ovary (small ovaries giving a relatively low set), and the vigour of the runners bearing the selfed flowers. There was no indication that the fruit setting tendency (after self-pollination) was heritable, though some strains normally bear more fruits per plant than others. Slight differences in fruit setting tendency were observed between several varieties and hybrids.
The relative earliness of the various strains was also studied.

808. CURRENCE, T. M. 635.64:575:581.143.26
Genes in the first chromosome of the tomato as related to time of fruit ripening.
Amer. Nat. 1934 : **68** : p. 73.
By crossing a late plant which was a homozygous recessive for the genes of the first chromosome *dpos* with an early plant of constitution *DPOS* and backcrossing the F_1 to the recessive parent, it was found that genes in this chromosome, cause a difference of $19 \pm 0{\cdot}85$ days in the time of ripening. The factors affecting earliness are thought to lie in the *dp* and *s* regions. The gene or genes in the *D* region hastened maturity by about 9 days and those in the *D* and *P* regions together by about 14 days. The *S* region had a variable effect in the presence of different combinations of other factors and produced a diminishing effect when combined with other genes for earliness. The *dpoS* plants were 10 days earlier than those with *dpos*, but the entirely dominant *DPOS* group was only 4 days earlier than the group recessive only for *s*. The association found may be due either to linkage or may be multiple effects of the marker genes.

809. MACARTHUR, J. W. 635.64:575–181
Fruit size effects of qualitative genes in the tomato.
Amer. Nat. 1934 : **68** : 73–74.
In the analysis of size inheritance material should be chosen with a wide range, known cytology and each chromosome marked by one or more qualitative genes. Tomato varieties exist with fruit size differences as great as 80 : 1 or even 200 : 1 and with qualitative genes located in each of 10 of the 12 chromosomes.
A study of fruit weights in 18 crosses shewed that qualitative genes, whether exerting effects on shape or not, often produce characteristic size effects, for example, *l* (lutescent) retards maturity by 2 weeks and reduces fruit weight by 30 per cent. Many genes (*d*, *r*, *y*, *c*, *h*, *u*) are nearly neutral in size effect and exhibit linkage with " size genes " in chromosomes I, II, III, IV and VII. The " multiple factors " for size are apparently usually dominant or recessive (not blending), and often very unequal (not polymeric) in effect ; the size genes as such may not exist except as one of the many effects of other genes.

810. HACKBARTH, J., LOSCHAKOWA–HASENBUSCH, N. 635.64:575"793"
and SENGBUSCH, R. v. 635.64:575.11–181
Die Züchtung frühreifer Tomaten mittels Kreuzungen zwischen *Solanum lycopersicum* und *Solanum racemigerum*. (**Breeding early tomatoes by crossing *S. lycopersicum* and *S. racemigerum*.**)
Züchter 1933 : **5** : 97–105.
In order to meet the requirements of the home (*i.e.* German) market for tomatoes throughout the year three possibilities are open to the plant breeder, namely the breeding of (1) early tomato varieties for growing under glass and in the open (2) cold resistant types for planting out early in spring and capable of withstanding the slight early frosts of autumn, and (3) tomatoes of good storage properties right into the month of December.

This paper deals with the first of these methods. The experimental material consisted of different varieties of *S. racemigerum*, *S. lycopersicum* and some F_1 hybrids of these two species.
The small fruited variety *S. racemigerum* was found to be 8–14 days earlier in ripening than the cultivated varieties of *S. lycopersicum*. In the F_2 from *S. racemigerum* x *S. lycopersicum* a relatively larger number of early plants appeared but only very few plants with moderately large sized fruits, whence it is inferred that large size of fruit is conditioned by multiple factors—a deduction which was confirmed by the F_3 behaviour.
A statistical study of the time when flowering begins and the time of ripening shewed that flowering in *S. racemigerum* is about 14 days earlier than in the cultivated varieties Bonner Beste, Dänische Export and Tuckswood and the time of ripening too was 14 days earlier in *S. racemigerum* as compared with the cultivated varieties.
The commencement of flowering and the period of ripening of two F_2 progenies shewed more or less marked deviations towards earliness.
High positive correlations between early flowering and earliness and also between size of berry and weight of fruit were found so apparently selections for earliness and weight of fruit could be carried out after flowering has begun.
From the results obtained it would appear that hybridization of *S. racemigerum* and *S. lycopersicum* represents a possible method of obtaining earlier types of tomatoes.

811. HUMPHREY, L. M. 635.64:576.312.35
The chromosomes of *Lycopersicum pimpinellifolium*.
Amer. J. Bot. 1932 : **19** : 812–13.

The haploid chromosome number of *L. pimpinellifolium* (the red currant tomato) and *L. esculentum* is 12, but significant morphological differences in the chromosomes and pollen grains were noted, the chromosomes in *L. pimpinellifolium* being small and fine and in *L. esculentum*, large and coarse.

812. 635.64–2.484:581.192
AGERBERG, L. S., SCHICK, R., SCHMIDT, M. and SENGBUSCH, R. v.
Die Bestimmung des Solaningehaltes von Pflanzen mit Hilfe von *Cladosporium fulvum*. Ein Beispiel für die Möglichkeit der Verwendung von Mikroorganismen in der züchterischen Selektionstechnik. (**The determination of the solanin content of plants by the aid of *C. fulvum*. An example of the possibility of utilizing micro-organisms in the technique of selective breeding.**)
Züchter 1933 : **5** : 272–80.

A method is described whereby the relative solanin content of parts of plants can be determined by comparing the effects of equally concentrated decoctions from the plants for investigation upon (1) the germination percentage of spores, (2) the length of the germ tubes of *Cladosporium fulvum*.
The technique could be used in plant improvement and in selection for various types of plants with a greater or lesser solanin content.
The solanin content of over 100 varieties of tomatoes was tested.

813. SCHMIDT, M. 635.64–2.484–1.521.6
Zur Entwicklungsphysiologie von *Cladosporium fulvum* und über die Widerstandfähigkeit von *Solanum racemigerum* gegen diesen Parasiten. (**On the developmental physiology of *C. fulvum* and the resistance of *S. racemigerum* to this parasite.**)
Planta (Berl.) 1933 : **20** : 407–39.

In order to elucidate the high resistance of *S. racemigerum* to *C. fulvum* a study was first made of the growth changes of the fungus on various substrates.
Pure solanin and the solanin which is obtained from certain organs of the tomato, *S. racemigerum*, and wild and cultivated potatoes affects both germination of the spores and the shape of their germ tubes. A high solanin content prevents spore germination while a weak solanin content results in the production of a typical form of hyphae distinct from that obtained on solanin free substrates, and on gradual dilution of the solanin content of substrates various transitional forms of hyphae are obtained.

On substrates of decoctions and expressed juice from the leaves of the *C. fulvum* resistant *S. racemigerum* the germination of the conidia is completely inhibited. This reaction is due not to a higher solanin content of the resistant variety but to an inhibitory principle which has been provisionally called " prohibitin." Its physiological properties are discussed ; and two other cases of this rarely demonstrated form of plant resistance due to the fungicide action of a substance (or substances) of known chemical composition are briefly considered.

814. PARKER, M. C. 635.65–2.19:575.061.6
The inheritance of a yellow-spot character in the bean.
J. Hered. 1933 : **24** : 481–86.

Crosses were made between the *Phaseolus vulgaris* normal green varieties, Michigan Robust and Well's Red Kidney, and a chlorophyll deficient form with the yellow spot defect.
Breeding continued into the F_3 shewed the yellow spot to be either a simple Mendelian dominant or possibly incompletely dominant to normal green.

815. MALINOWSKI, E. 635.652:575.127:575.125
Phénomènes de l'accroissement de la vigueur chez les hybrides de "*Phaseolus vulgaris*" (L.) Savi. [**Phenomena of heterosis in hybrids of *Ph. vulgaris* (L.) Savi.**]
C.R. Soc. Biol. Varsovie 1933 : **111** : 1035–36.

Certain crosses between varieties of *Ph. vulgaris* shew heterosis in their larger leaves and number of branches. They also mature later than the parent varieties.
In F_2 a transgressive segregation took place, plants were found of the size of those of F_1 and of the parent varieties and others more vigorous than the F_2.
The curves of variability for height of plant, size of leaves and number of internodes were asymmetric. The mode, instead of corresponding approximately to that of the F_1 curve approximated to that of the parent varieties. It is suggested that besides the heterosis which has been explained by the theory of dominant factors, there are other phenomena involved which do not fall into this category.
It is possible that the action of several co-operating factors which are separated in the parent varieties and are united in the hybrid may explain the peculiar case here described. The author distinguishes four types of heterosis as examplified by (1) *Zea*, (2) *Galeopsis*, (3) *Antirrhinum* and (4) *Phaseolus*.

816. 635.652:576.312
TSCHECHOW, W. and KARTASCHOWA, N. 635.652:576.312.35
Karyologisch-systematische Untersuchung der Tribus *Loteae* und *Phaseoleae* Unterfam. *Papilionatae*. (**Systematic-karyological investigation of the tribe *Loteae* and *Phaseoleae* subfam. *Papilionatae*.**)
Cytologia 1932 : **3** : 221–49.

In the *Phaseoleae* the most frequent chromosome number is 22 (= 2n), while 24, 28 and 40 are rare. *Clitoria ternatea* has only 16 chromosomes.

817. STRANSKI, I. T. and NIKOLOFF, J. 635.652:581.6
Über die Kochfähigkeit der Ackerbohnensamen (*Phaseolus vulgaris* L.) (**The cooking properties of *Phaseolus vulgaris* L.**)
Landw. VchStat. 1934 : **118** : 219–32.

This paper is mainly devoted to the description of the elaboration of a simple and accurate technique for determining the cooking quality of *Phaseolus vulgaris* L. Variation in culinary quality was studied in Bulgarian varieties of beans.
Tests of 205 samples of beans representing 4 varieties shewed that var. *ellipticus* (Mart) Alef. was superior to other types in cooking quality and this variety is therefore recommended for use in breeding to improve this character.
The relation between morphological varietal characteristics and cooking quality and the genetic basis of the latter property are now being investigated.

818. WINGARD, S. A. 635.652–2.452–1.521.6:575
The development of rust resistant beans by hybridization.
Tech. Bull. Va. Agric. Expt. Sta., 1933 : No. 51 : Pp. 40.
A description is given of the factor for resistance to rust (*Uromyces appendiculatus*) and the isolation of rust resistant strains from the susceptible varieties of beans, the Kentucky Wonder and Boston Navy, by crossing them with the rust resistant forms Improved Goddard, Brockton Pole and Horticultural Pole. Other combinations also made included Powell Prolific another susceptible variety crossed with the resistant type Marblehead
The technique is described in detail. The F_1 plants of all these crosses and their reciprocals (where made) indicated that resistance was a dominant character ; and in F_2 the ratios obtained shewed monofactorial inheritance of resistance.
After continued breeding through some twenty generations for 15 years, a number of excellent types of Navy and Kentucky Wonder hybrids that were also rust resistant were obtained.
The question of possible linkage between rust resistance and other characters of the rust resistant parents is raised.
Rust resistance in beans is, in the author's opinion, best explained on the basis of the hypersensitiveness of the host to the parasite.
Incidentally data were collected on the effects in F_1 of crossing on the size and shape of the seeds, the number of pods, the vigour and yield, pod length and number of seeds per pod, length of petioles and internodes and leaf size; also the effects of crossing on size, shape and colour of F_2 seeds were recorded.
A bibliography of 70 references is amplified by a discussion of the literature on disease resistance in general.

819. SCHREIBER, F. 635.652–2.483–1.521.6:575.11
Resistenz-Züchtung bei Buschbohnen. (**Breeding for resistance in bush beans.**)
Kühn-Archiv 1933 : **38** : 287–92.
Further work on the inheritance in the progeny of Anthracnose Resistent Cornel No. 22 x Konserva and x Wachs Beste von Allen of resistance to *Colletotrichum Lindemuthianum* (see " Plant Breeding Abstracts," Vol. II, Abst. 718) has shewn that to explain the results five more factors for resistance must be added to the three already found.
In spite, however, of this increase in genetical factors and in the number of physiological races of the infecting organism, it is still possible to obtain immune plants in the sixth generation which are homozygous and resistant to all races of *Colletotrichum*.

820. POPESCO, C. T. 635.652:635.932–1.541
Obtention par greffe d'un haricot vivace. (**A perennial French bean obtained by grafting.**)
C.R. Acad. Sci. Paris 1933 : **196** : 1433–35.
Phaseolus vulgaris annual was used as stock and scion for *Desmodium canadense* perennial. Where the beans were used as the scion maturity was retarded by 20–30 days. At the beginning of November the plants, both *Phaseolus* and *Desmodium*, were cut back and potted and the pots placed in a cold greenhouse (plants left out of doors died, as in Rumania where the experiment was made, the winter is very severe.)
Phaseolus scions began to grow again in March *i.e.* before the controls but ripened 20–30 days later as before and these results were consistently maintained for four years.
After this period seeds taken from these perennial beans were sown and the resultant plants proved to be perennial, giving shoots in the spring from the upper part of the swollen root and so producing a multi-stemmed plant.

821. 635.655(92.2)

De kedelé-cultuur. **(Soya bean culture.)**
Bergcultures 1933 : 7 : 1291–92.

A new variety of soya bean No. 27 grown in East Java has given remarkably good results in the Presidency of Madioen, and its use is recommended to improve the quality of this crop. In West Java the value of the soya bean is being tested as a green manure and as a catch crop grown in rubber plantations.

822. 635.655:575(43)
635.655:581.19

RIEDE, W. and REWALD, B.
Beiträge zur Sojafrage. **(On the soya bean question.)**
Landw. Versuchsstat. 1933 : 117 : 313–36.

The results of cultural and breeding experiments in 1931 and 1932 with selected biotypes from natural crosses or mutations are recorded with data on chemical analysis and the related questions of correlative modification and variation in a number of pure lines and varieties.
In spite of a certain negative genetic correlation between fat and protein content it should still be possible to breed varieties with a very high fat (ca. 20 per cent) and protein content (ca. 38 per cent).
From the present investigation (based on correlation tables and correlation lines worked out by Johannsen's method), no reliable correlations were, however, found between the fat, protein and lecithin contents—a result which was to be expected owing to the multiple factor basis of these characters. Similarly no reliable correlation was discovered between external characters and seed content ; and selection on the basis of such characters must often give inferior results as regards seed quality.
A table shewing the composition of the seed in two segregating progenies and exemplifying the negative fat protein correlation is given.
The need for extensive soya cultivation and breeding in Germany is emphasized.

823. 635.655:576.3
635.655:575

FUKUDA, Y.
Cyto-genetical studies on the wild and cultivated Manchurian soy beans (*Glycine L.*)
Jap. J. Bot. 1933 : 6 : 489–506.

The varieties investigated belonged to the species *Glycine hispida* Max., *G. gracilis* Skvortzow and *G. Soja* S. et Z. The somatic chromosome number for all three species was 40 and the haploid number 20 and the size and morphology of the chromosomes was similar in all species examined. The development and cytological phenomena of the pollen grains are described in detail and are similar in all three species. No marked varietal difference in size of the pollen grains was observed.
If the varieties are arranged on the basis of their seed weight *G. Soja* is found to have the lightest seeds, *G. hispida* the heaviest and *G. gracilis* seeds of medium weight. Blending inheritance attributed to multiple factors for seed weight and other morphological characters was observed on crossing. Moreover, further investigations suggested that the different characteristics of the varieties of soya beans are due to different combinations of multiple Mendelian factors.
On the basis of Vavilov's gene centre theory and evidence derived from the distribution of the varieties, Manchuria is regarded as the original centre of evolution of soya beans.
Though many intermediate varieties exist the following systematic grouping is suggested by the author :—
G. hispida comprising various varieties of cultivated soya beans ; *G. Soja* comprising original wild forms and *G. gracilis* comprising intermediate semi-cultivated forms.

824. HOLLOWELL, E. A. and JOHNSON, H. W. 635.655–2.7–1.521.6:581.49
Correlation between rough-hairy pubescence in soybeans and freedom from injury by *Empoasca fabae*.
Phytopathology 1934 : **24** : p. 12. (Abst.)
The experimental material consisted of three generations raised from a cross between a rough-hairy and a dominant glabrous type of soya bean. The glabrous homozygous and heterozygous individuals grown, totalling 8,570, were all heavily infested with *Empoasca*, stunted in growth, and displaying leaf injuries. On the other hand the rough-hairy individuals numbering 6,755 were practically free from *Empoasca* and in vigorous condition.

825. LAMPRECHT, H. 635.656:575.11:581.466
Ein *unifoliata*-typus von *Pisum* mit gleichzeitiger Pistilloidie. (**A *unifoliata* type of *Pisum* accompanied by pistilloidy.**)
Hereditas 1933 : **18** : 56–64.
The abnormal type of pea described, which occurred among the progeny of the cross Stens x Concordia, had in general simple leaves instead of the usual paired leaflets, the peduncle was much branched and bore in place of flowers proliferations which proved to be an extreme case of pistilloidy.
The *unifoliata* character was inherited as a simple recessive, but whether it was a case of one gene influencing three different characters or a case of the close linkage between genes requires further investigations.
The inheritance of tendrils Tl which are flattened when in the heterozygous condition was studied in relation to the *Uni* gene.

826. LAMPRECHT, H. 635.656:575.116.1
Das Gen *Uni* und seine Koppelung mit anderen Genen bei *Pisum*. (**The *Uni* gene and its linkage with other genes in *Pisum*.**)
Hereditas 1934 : **18** : 269–96.
The allelomorphs Uni-uni which determine the *unifoliata* type of pea, already described (see Abst. 000), are further investigated especially in relation to other genes.
A cross was made to discover whether linkage existed between Uni-uni and Tl-tl, the gene pair determining the appearance of tendrils and R the gene for round seeds.
In this cross linkage was only found between Rr and Tl, with a crossing-over percentage of 2·38. In another cross in which the genes Le-le (high-low growth), A-a (a colour base), Ar-ar and B-b genes for colour when present with A, M-m (mottling of the testa), and Pl-pl (black and white hilum) as well as Uni-uni Tl, D and R were involved, Le, A, Ar and Pl were inherited independently of each other, while linkage was found between Uni and M with a crossing-over percentage of 3·1. Although in this case no linkage was shewn between Uni and B, previous results have made it clear that it exists with a crossing over value of about 50 per cent. Uni, M and B therefore belong to one linkage group.
Segregation for leaf type was observed in the progeny of three crosses and this was further investigated. The data shew that the various types of leaves and the frequency of their occurrence are genetically determined, and that at least three pairs of genes are concerned. It is interesting to note that some of the leaf types are characteristic of different genera of the Leguminosae.

827. BOURDOUIL, C. 635.656:575.127.2:575.11
Sur quelques caractères intermédiaires des hybrides de deuxième génération entre espèces de *Pisum* (*P. sativum* avec *P. arvense*.) [**On some intermediate characters in the F_2 hybrids between species of *Pisum* (*P. sativum* with *P. arvense*.)**]
C.R. Acad. Sci. Paris, 1933 : **197** : 531–33.
The F_1 of *P. sativum* (var. Le Délicieux) with large pods and wrinkled grains crossed with *P. arvense* with small pods and round grains, were tall and had pods intermediate in size. The testa (F_2) was uniformly brown, speckled with violet like *P. arvense*. In classifying the grains

as round or wrinkled those shewing slight depressions on their surfaces were classed as smooth and a ratio of 3 round to 1 wrinkled was obtained. Investigations on the imbibition and starch content of the grains shewed that the intermediate condition did, in fact, exist.
Weight of grain was also an intermediate character always approaching the average weight of the lighter parent.

828. SANSOME, E. R. 635.656:576.356.2
Segmental interchange in *Pisum* II.
Cytologia 1933 : 5 : 15–30.
Some of the progeny of a plant with an association of six chromosomes often in the form of a " figure of eight " previously described (see " Plant Breeding Abstract," Vol. II, Abst. 725) were examined cytologically.
Two of the plants were trisomics and structurally hybrid, the rest diploids. One was fertile and shewed normal pairing, two had an association of four chromosomes at meiosis and one was three-quarter sterile and resembled the parent plant in having an association of six chromosomes. The trisomics could be distinguished by the presence of a number of tetrahedral pollen grains among the normal oval-shaped grains.
The relationships of the new association of four are discussed and their occurrence, previously predicted, is confirmation of the assumption that segmental interchange can occur between chromosomes which are interstitially homologous but terminally non-homologous.

BOOK REVIEWS

HARWOOD, W. S. 575.12
New creations in plant life. An authoritative account of the life and work of Luther Burbank.
The MacMillan Company, New York, 1930 : 10s. 0d. Pp. xiv + 430.
This book, first published in 1905 and again reprinted in 1930, deals in a readable and popular way with the life and work of the American plant breeder Luther Burbank. Long before the laws of Mendel were rediscovered Burbank was crossing and selecting on a scale never used before and with marked success. Without scientific training but by acute observation and innate intuition he was able to select from among thousands of plants the few or perhaps only one which would answer his purpose, the rest were ruthlessly discarded. His work was always undertaken with a definite aim in view, the improvement in beauty or utility of the plant concerned.
The plum and the potato which bear his name, the Shasta daisy, the thornless cactus, to mention only a few of his successes, indicate the range and variety of his work which was never done for profit.
Because of the lack of published records of his work, the book is a useful reminder of the achievements of a notable man.

FRAIPONT, C. and LECLERQ, S. 576.12
I. L'évolution. Adaptations et mutations. Berceaux et migrations. (**I. Evolution. Adaptations and mutations. Centres of origin and migrations.**)
Hermann and Cie, Paris, 1932 : 9 *fr.* Pp. 38. 9 illus.
FRAIPONT, C.
II. Adaptations et mutations. Position du problème. (**II. Adaptations and mutations. Position of the problem**).
Hermann and Cie, Paris, 1932 : 6 *fr.* Pp. 26.
In a series to comprise four volumes, the authors set out to examine the main theories of evolution and to shew that while no single theory offers a complete and satisfactory explanation of the facts, constructive ideas may be drawn from each one. Though they do not claim to have solved the problem of evolution, the authors hope they have avoided the pitfalls into which many have fallen.

In the first volume the theory of centres of origin and subsequent migration to account for the distribution of species in this and prehistoric times is examined in the light of Rosa's theory of hologenesis.

From an examination of the present distribution of various species of plants and animals compared with their distribution as shewn from the fossil remains, it is held that instead of having migrated from a centre of origin, a common set of conditions acting on the same material produced similar forms in nearly every part of the world, but that owing to subsequent changes in the conditions the forms have died out in many parts.

The authors consider it most improbable that mutations should have produced similar forms in different parts of the world, and regard them, though as important for the production of variation, yet not as the main factor in evolution.

In discussing the value of the theories of mutations and adaptations as a basis for evolution, the authors consider the experiments designed to test the inheritance of acquired characters too crude to be of much value. In their opinion the effect on the soma of some change in external conditions lasting for a great number of years may result in changes in the secretion of glands or other effects which will in time influence the reproductive cells themselves and evolution will proceed in an orderly sequence by the close adaptation of the organism to its environment.

KRENKE, N. P. 581.1

Wundkompensation Transplantation und Chimären bei Pflanzen. (**On compensatory reactions to wounding and on grafting and chimaeras in plants.**)

Julius Springer, Berlin, 1933: Unbound RM. 88, bound R.M. 89.80. Pp. xvi + 934. 203 illus.

The basis for this monograph, which is concerned mainly with the experimental side of the subject is the Russian work, " Plant Surgery " of 1928, which has been so elaborated and extended by the addition of a series of experiments that the present German translation practically represents a new piece of work.

The first part deals with the classification of the effects of mechanical agents on plants which occur under natural conditions; the second and larger part deals with the effect of artificial agents such as cause wounds and covers the problems of vegetative propagation and grafting, a very full account of chimaeras and a section devoted to the introduction of extraneous substances into the plant. Besides a very full review of the literature, the author's own experiments make this a valuable source of information for all interested in the problems presented.

Particular attention is paid to malformations which are regarded as differing from variations only in degree.

The sections on propagation and grafting should be of special interest to the plant breeder for the author holds that the capacity for vegetative regeneration is a heritable character and points out that it should be possible, if one parent in a cross possesses the character, to transmit it to the F_1 and so make it unnecessary to wait for true breeding hybrids, and that grafting provides a means for the propagation of hybrids which are still heterozygous or of somatic mutations.

The book is illustrated by excellent photographs and two coloured plates.

A bibliographical list covering 33 closely printed pages completes the volume.

ZADE, A. 633–1(43)

Pflanzenbaulehre für Landwirte. (**The science of plant cultivation for farmers.**)

Paul Parey, Berlin, 1933: Unbound RM 23, bound RM 24.80: Pp. xi + 533. 72 illus.

This valuable guide to the cultivation of agricultural crops in Germany has a sound scientific basis. Beginning with a brief definition of the characters of wild and cultivated plants, the

species concept, and some of the corporative and state measures for the furtherance of agriculture, the main crops are dealt with in turn.

A general account is first given of the botanical aspect of a cereal plant, in which though the technical terms are employed the more descriptive common terms are also given. There follows an account of the chief cereal crops, rye, wheat, barley and oats, giving for each one its distribution, origin, important botanical characters, varieties, climate, soil, place in rotation, manuring, preparation of the soil, seed and sowing, cultivation, harvest and yield capacity. In the same way are treated the, for Germany, less important cereals, maize, millets and buckwheat, the Leguminosae, oil plants, fibre plants, stimulants (tobacco and hops), pasture and forage crops, roots and tubers. The book is illustrated with a few good diagrams and photographic plates.

SURÁNYI, J. and VILLAX, E. 633.15(43.91)
Maissorten in Ungarn. (**Varieties of corn in Hungary**).
Hungary, 1932 : 10*s.* 0*d.* Pp. 64. 40 illus. (" Patria " Bookstore, Üllői Street, Budapest IX.).

A description of the origin and of the characters of practical value of the varieties of flint, dent, sweet and puff maize grown in Hungary.

The notes on such physiological characters as length of growing period, etc. apply naturally, only to central European conditions. An ample summary is given in English and there are coloured prints of the most important varieties. The names and addresses are given of breeders, etc., who sell the varieties described.

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